UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OR 97232-1274

Refer to NMFS Consultation No.:
WCRO-2019-00059

October 24, 2019

Jose L. Linares
District Manager, Northwest Oregon
Bureau of Land Management
1717 Fabry Road SE
Salem, Oregon 97306

Re: Endangered Species Act Section 7(a)(2) Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for Integrated Invasive Plant Management for the Northwest Oregon District, Bureau of Land Management

Dear Mr. Linares:

Thank you for your letter of February 20, 2019, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for Integrated Invasive Plant Management for the Northwest Oregon District, Bureau of Land Management. In this opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*), Upper Willamette River (UWR) Chinook salmon, LCR coho salmon (*O. kisutch*), Oregon Coast coho salmon, LCR steelhead (*O. mykiss*), UWR steelhead, or result in the destruction or adverse modification of their designated critical habitat.

As required by section 7 of the ESA, NMFS is providing an incidental take statement with the opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal action agency must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of listed species.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action. NMFS also reviewed the likely effects of the proposed action on essential fish habitat (EFH), pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)), and concluded that the action would adversely affect the EFH of Pacific salmon (PFMC 2014). We included two conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH, and have included the results of that review in Section 3 of this document. The MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

Please contact Mischa Connine of the Oregon/Washington Coastal Office at 503-230-5401, or Mischa.Connine@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Kim W. Kratz, Ph.D.
Assistant Regional Administrator
Oregon Washington Coastal Office

cc: Cory Sipher

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the

Integrated Invasive Plant Management for the Northwest Oregon District, Bureau of Land Management

NMFS Consultation Number: WCRO-2019-00059

Action Agency: Bureau of Land Management

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Lower Columbia River Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	Yes	No	Yes	No
Upper Willamette River Chinook salmon	Threatened	Yes	No	Yes	No
Lower Columbia River coho salmon (*O. kisutch*)	Threatened	Yes	No	Yes	No
Oregon Coast coho salmon	Threatened	Yes	No	Yes	No
Lower Columbia River steelhead (*O. mykiss*)	Threatened	Yes	No	Yes	No
Upper Willamette River steelhead	Threatened	Yes	No	Yes	No

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Kim W. Kratz, Ph.D.
Assistant Regional Administrator
Oregon Washington Coastal Office

Date: October 24 2019

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1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), and implementing regulations at 50 CFR 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). A complete record of this consultation is on file at the Oregon Washington Coastal Office.

Updates to the regulations governing interagency consultation (50 CFR part 402) will become effective on October 28, 2019 [84 FR 44976]. Because this consultation was pending and will be completed prior to that time, we are applying the previous regulations to the consultation. However, as the preamble to the final rule adopting the new regulations notes, "[t]his final rule does not lower or raise the bar on section 7 consultations, and it does not alter what is required or analyzed during a consultation. Instead, it improves clarity and consistency, streamlines consultations, and codifies existing practice." Thus, the updated regulations would not be expected to alter our analysis.

1.2 Consultation History

On October 18, 2018, the Bureau of Land Management (BLM) presented a proposal of the Invasive Plant Management for the Northwest Oregon District (NOD) at the Northwest Oregon Level 1 Aquatic Team (Level 1) meeting. On December 14, 2018, the BLM submitted a draft biological assessment (BA) for review. We provided comments to the BLM on December 17, 2018. On February 20, 2019, we received a request from the BLM for ESA section 7 consultation for Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*), Upper Willamette River (UWR) Chinook salmon, LCR coho salmon (*O. kisutch*), Oregon Coast coho salmon, LCR steelhead (*O. mykiss*), UWR steelhead, and designated critical habitat for these species. Consultation was initiated on February 20, 2019. This opinion is based on information provided during the above-mentioned meeting, the BA, and other relevant information as described below.

1.3 Proposed Federal Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). "Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). There are no interdependent or interrelated activities associated with the proposed action.

Currently, the BLM's invasive plant management program is covered by ESA and EFH consultation provided through the Programmatic Aquatic Restoration Biological Opinion (ARBO II) (NMFS 2013a). The BLM proposes to treat invasive plants using the Integrated Invasive Plant Management for the Northwest Oregon District in place of treating invasive plants under ARBO II (NMFS 2013a). This is because the BLM proposes to treat all unwanted terrestrial invasive plants (not just noxious weeds) with herbicides, and to expand the program to include the use of additional herbicides not currently covered under ARBO II (NMFS 2013a) (Fluroxypyr, fluazifop-P-butyl, hexazione, and Rimsulfuron), and to expand the use of current herbicides covered under ARBO II using different aquatic criteria (2,4-D amine, glyphosate, imazapyr, and triclopyr BEE and TEA). As described in the Oregon FEIS for Integrated Invasive Plant Management (USDI 2010a), the wider range of herbicides from which to choose would increase the effectiveness of the average treatment to an estimated 80 percent (USDI 2010a). Although some level of retreatment would still take place as necessary, the additional herbicides would substantially improve the chances invasive plants would be controlled with fewer re-treatments (USDI 2010a). The BLM proposes to use only the adjuvants and surfactants identified in ARBO II (NMFS 2013a).

The BLM is also proposing a new method of mechanical treatment that is not covered in ARBO II (NMFS 2013a): Targeted grazing by goats or sheep.

In addition, the BLM proposes to replace the individual Resource Area invasive plant management plans with one management plan for the NOD. The Integrated Invasive Plant Management for the NOD would replace the following management plans: (1) Westside Salem Integrated Non-native Plant Management Plan Final Decision and Rationale (USDI 2008d); (2) Cascades Resource Area Invasive Non-native Plant Management Decision Record (USDI 2009); (3) Marys Peak Resource Area Noxious Weed Control Utilizing Glyphosate Final Decision and Rationale (USDI 2010b); (4) Categorical Exclusion: Siuslaw Field Office and Upper Willamette Field Office Invasive Plant Control (USDI 2018); and (5) the Sandy Wild and Scenic River and State Scenic Waterway Environmental Assessment and Management Plan (USDI 1993).

Under the proposed action, the BLM would treat approximately 1,000 to 6,000 gross acres (on average 3,000 gross acres) annually. As shown in Appendix C in EA (BLM 2018), approximately 25 percent (1,500 acres) of those treatments would be with herbicide and 75 percent (4,500 acres) would be with non-herbicide treatments. Of the non-herbicide treatments, the majority would be manual (50 percent) and mechanical (45 percent). Of the 19 herbicides analyzed in the Integrated Invasive Plant Management EA, 78 percent of all applications are comprised of four herbicides. About 26 percent of the herbicide treatments would be with aminopyralid, 19 percent with glyphosate, 10 percent with imazapyr, and 23 percent with triclopyr BEE and TEA. The remaining 15 herbicides would each be used 5 percent of the time or less.

Herbicide treatments would be spot treatments applied by backpack sprayer or other ground-based method 95 percent of the time and broadcast treatments 5 percent of the time. See Appendix B in the EA (BLM 2018) for more information about ground-based herbicide treatment methods and the Treatment Key in Appendix C in the EA (BLM 2018) for information about how specific infestations would be treated.

1.3.1 Program Administration

1. **Integration of Project Design Criteria (PDC), and Standard Operating Procedures (SOPs), Conservation Measures and Terms and Conditions into Project Design and Contract Language –** The BLM shall incorporate appropriate aquatic and terrestrial conservation measures along with PDCs, and SOPs listed in the BA along with any terms and conditions included in the subsequent BLM Integrated Invasive Plant Management opinion into contract language or force-account implementation plans.
2. **Project Notification -** The BLM and NMFS will review and discuss invasive plant management projects planned for implementation during an upcoming work season through their team-specific processes. The BLM shall provide a Project Notification Form to BLMInvasive-WCR@noaa.gov 30 days prior to implementation and will include the following information:
    a. Action identifier – The same unique identification number is necessary for each project's Action Notification and Project Completion reports.
    b. Project name – Use the same project name from notification to completion (*e.g.*, Jones Creek, Tillamook Co., Oregon).
    c. Location – 6th field HUC (hydraulic unit code), stream name, and latitude and longitude (decimal degrees)
    d. Agency contact – Agency and project lead name
    e. Timing – Project start and end dates
    f. Project description – Brief narrative of the project and objectives
    g. Extent – Number of stream miles or acres to be treated
    h. Species affected – Listed Fish or Wildlife species, Critical Habitat, or EFH affected by project
    i. Date of submittal
    j. Verification – Check box that verifies that all appropriate General Aquatic Conservation Measures, Wildlife Conservation Measures, Project Design Criteria for Aquatic Restoration Activity Categories, and Project Design Criteria for Terrestrial Species and Habitats have been thoroughly reviewed and will be incorporated into project design, implementation, and monitoring.
3. **Project Completion Report** –The BLM will submit a Project Completion Report to BLMInvasive-WCR@noaa.gov and their NMFS Level 1 Team counterpart. Reports are due 60 days after project completion. Reports will include the following information:
    a. Action identifier (same number as in notification).
    b. Action name (same name as in notification).

c. Location – 6th field HUC, stream name, latitude and longitude.
d. Agency contact – Agency and project lead name.
e. Date of submittal.
f. Timing – Actual project start and end dates.
g. Extent – Number of stream miles or acres treated.
h. Species affected – Fish or wildlife species, critical habitat, or EFH affected by the project.

4. **Annual Program Report –** The BLM will provide an annual program report to NMFS that describes projects funded or carried out under program. The report will include the following information:
   a. An assessment of overall program activity.
   b. A map showing the location and category of each project carried out under program.
   c. A list of any projects that were funded or carried out by the BLM under the program.
   d. Data collected or monitoring that the BLM deems necessary or helpful to assess habitat trends as a result of actions carried out under the program.

Invasive Plant Management

The BLM proposes to use manual and mechanical invasive plant management, and terrestrial and aquatic herbicides as part of the Integrated Invasive Plant Management program. Table 1 shows the proposed methods the BLM will use. “Manual methods” include hand-pulling, digging, grubbing, solarization (plastic covering over the vegetation). “Mechanical methods” include mowing, tilling or disking, string trimmers, propane torch, seeding and planting, prescribed fire, biological control agents (generally insects), and targeted grazing by goats or sheep.

Table 1. Summary of the proposed actions included in the Integrated Invasive Plant Management program. The shaded cells include the herbicides that were not covered under ARBO II) (NMFS 2013a).

Manual and Mechanical Methods	
Manual	(Aquatic and Terrestrial)
Mechanical	(Aquatic and Terrestrial)
Competitive seeding and planting	(Terrestrial)
Biological control agents	(Terrestrial)
Prescribed fire	(Terrestrial)
Targeted grazing by goats or sheep	(Terrestrial)
Herbicides	
2,4-D amine[1]	(Aquatic and Terrestrial)
Aminopyralid	(Terrestrial)
Chlorsulfuron	(Terrestrial)
Clopyralid	(Terrestrial)
Dicamba	(Terrestrial)
Diflufenzopyr + dicamba	(Terrestrial)
Fluroxypyr	(Terrestrial)
Fluridone	(Aquatic)
Fluazifop-P-butyl[2]	(Terrestrial)
Glyphosate	(Aquatic and Terrestrial)
Hexazinone	(Terrestrial)
Imazapic	(Terrestrial)
Imazapyr	(Aquatic and Terrestrial)
Metsulfuron methyl	(Terrestrial)
Picloram	(Terrestrial)
Rimsulfuron	(Terrestrial)
Sethoxydim[1]	(Terrestrial)
Sulfometuron methyl	(Terrestrial)
Triclopyr BEE and TEA	(Aquatic and Terrestrial)

Terrestrial Herbicides

The proposed action includes the use of the following terrestrial herbicides not addressed in ARBO II: Fluroxypyr, fluazifop-P-butyl, hexazione, and rimsulfuron. The application of herbicides to terrestrial populations would involve either spot treatment or treatments using hand-held or ground based methods 95 percent of the time and broadcast treatments 5 percent of the time (BLM 2018).

[1] 2, 4-D is commonly formulated as either an amine salt or ester. Esters have higher vapor pressures than amines. Higher vapor pressures result in increased volatilization. Amine salts are generally less volatile than esters. Amine formulations are typically used in landscape settings and scenarios when drift is a primary concern. PennState Extension. Amines or Esters; Which should you use? April 30, 2014. https://extension.psu.edu/amines-or-esters-which-should-you-use accessed 8/6/19.

[2] Research and demonstration plots of fluazifop-P-butyl and sethoxydim can only be used on a maximum of 15 acres/year per field office.

The BLM will apply greater restrictions on the use of triclopyr BEE and TEA than what is currently allowed in ARBO II (NMFS 2013a). In watersheds that support Federally listed as threatened or endangered, or proposed (TEP) species or their habitat, triclopyr BEE and TEA will not be applied in upland habitats within 0.5 miles upslope of aquatic habitats that support aquatic TEP species under conditions that would likely result in surface runoff.

All other applicable PDCs for herbicide treatments (PDCs 10-20, and 33) listed in ARBO II (NMFS 2013a) would be used when implementing terrestrial treatments and are as follows:

1.3.2 General Aquatic Conservation Measures

10. Technical Skill and Planning Requirements

a. Ensure that an experienced fisheries biologist or hydrologist is involved in the design of all projects covered by this opinion. The experience should be commensurate with technical requirements of a project.

b. Planning and design includes field evaluations and site-specific surveys, which may include reference-reach evaluations that describe the appropriate geomorphic context in which to implement the project. Planning and design involves appropriate expertise from staff or experienced technicians (*e.g.*, fisheries biologist, hydrologist, geomorphologist, wildlife biologist, botanist, engineer, silviculturist, fire/fuels specialists).

c. The project fisheries biologist/hydrologist will ensure that project design criteria are incorporated into implementation contracts. If a biologist or hydrologist is not the Contracting Officer Representative, then the biologist or hydrologist must regularly coordinate with the project Contracting Officer Representative to ensure the project design criteria and conservation measures are being followed.

11. Climate Change – Consider climate change information, such as predictive hydrographs for a given watershed or region, when designing projects covered by this opinion.

12. In-water Work Period – Follow the appropriate state (ODFW 2008; WDFW 2010) or most recent guidelines for timing of in-water work. If work occurs in occupied Oregon chub habitat, in-water work will not occur between June 1 and August 15. In those few instances when projects will be implemented in California, Idaho, or Nevada, follow appropriate state guidelines. The Action Agencies will request exceptions to in-water work windows through Level 1 NMFS or USFWS representatives as well as essential state agencies. [3] For National Forests in the state of Washington, the Forest Service will work with Washington Department of Fish and Wildlife (WDFW) to determine in-water work periods, using the process contained in the 2012 Memorandum of Understanding between the WDFW and USDA-Forest Service, Pacific Northwest Region regarding hydraulic projects conducted by the Forest Service (WDFW and USDA-Forest Service 2012).

13. Fish Passage – Fish passage will be provided for any adult or juvenile fish likely to be present in the action area during construction, unless passage did not exist before

[3] At NMFS, branch chiefs will have the authority to approve variances.

construction, stream isolation and dewatering is required during project implementation, or where the stream reach is naturally impassible at the time of construction. After construction, adult and juvenile passage that meets NMFS's fish passage criteria (NMFS 2011e) will be provided for the life of the structure.

14. **Site Assessment for Contaminants –** In developed or previously developed sites, such as areas with past dredge mines, or sites with known or suspected contamination, a site assessment for contaminants will be conducted on projects that involve excavation of >20 cubic yards of material. The action agencies will complete a site assessment to identify the type, quantity, and extent of any potential contamination. The level of detail and resources committed to such an assessment will be commensurate with the level and type of past or current development at the site. The assessment may include the following:

a. Review of readily available records, such as former site use, building plans, records of any prior contamination events.
b. Site visit to observe the areas used for various industrial processes and the condition of the property.
c. Interviews with knowledgeable people, such as site owners, operators, occupants, neighbors, local government officials, *etc.*
d. Report that includes an assessment of the likelihood that contaminants are present at the site.

15. **Pollution and Erosion Control Measures –** Implement the following pollution and erosion control measures:

a. Project Contact: Identify a project contact (name, phone number, an address) that will be responsible for implementing pollution and erosion control measures.
b. List and describe any hazardous material that would be used at the project site, including procedures for inventory, storage, handling, and monitoring; notification procedures; specific clean-up and disposal instructions for different products available on the site; proposed methods for disposal of spilled material; and employee training for spill containment.
c. Temporarily store any waste liquids generated at the staging areas under cover on an impervious surface, such as tarpaulins, until such time they can be properly transported to and treated at an approved facility for treatment of hazardous materials.
d. Procedures based on best management practices to confine, remove, and dispose of construction waste, including every type of debris, discharge water, concrete, cement, grout, washout facility, welding slag, petroleum product, or other hazardous materials generated, used, or stored on-site.
e. Procedures to contain and control a spill of any hazardous material generated, used or stored on-site, including notification of proper authorities. Ensure that materials for emergency erosion and hazardous materials control are onsite (*e.g.*, silt fence, straw bales, oil-absorbing floating boom whenever surface water is present).
f. Best management practices to confine vegetation and soil disturbance to the minimum area, and minimum length of time, as necessary to complete the action, and otherwise prevent or minimize erosion associated with the action area.

g. No uncured concrete or form materials will be allowed to enter the active stream channel.

h. Steps to cease work under high flows, except for efforts to avoid or minimize resource damage.

16. Site Preparation

a. **Flagging sensitive areas –** Prior to construction, clearly mark critical riparian vegetation areas, wetlands, and other sensitive sites to minimize ground disturbance.

b. **Staging area –** Establish staging areas for storage of vehicles, equipment, and fuels to minimize erosion into or contamination of streams and floodplains.

   i. No Topographical Restrictions – place staging area 150 feet or more from any natural water body or wetland in areas where topography does not restrict such a distance.

   ii. Topographical Restrictions –place staging area away from any natural water body or wetland to the greatest extent possible in areas with high topographical restriction, such as constricted valley types.

c. **Temporary erosion controls –** Place sediment barriers prior to construction around sites where significant levels of erosion may enter the stream directly or through road ditches. Temporary erosion controls will be in place before any significant alteration of the action site and will be removed once the site has been stabilized following construction activities.

d. **Stockpile materials –** Minimize clearing and grubbing activities when preparing staging, project, and or stockpile areas. Any LW, topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration. Materials used for implementation of aquatic restoration categories (*e.g.*, LW, boulders, fencing material) may be staged within the 100-year floodplain.

e. **Hazard trees –** Where appropriate, include hazard tree removal (amount and type) in project design. Fell hazard trees when they pose a safety risk. If possible, fell hazard trees within riparian areas towards a stream. Keep felled trees on site when needed to meet coarse LW objectives.

17. Heavy Equipment Use

a. **Choice of equipment –** Heavy equipment will be commensurate with the project and operated in a manner that minimizes adverse effects to the environment (*e.g.*, minimally-sized, low pressure tires, minimal hard turn paths for tracked vehicles, temporary mats or plates within wet areas or sensitive soils).

b. **Fueling and cleaning and inspection for petroleum products and invasive weeds**

   i. All equipment used for instream work will be cleaned for petroleum accumulations, dirt, plant material (to prevent the spread of noxious weeds), and leaks repaired prior to entering the project area. Such equipment includes large machinery, stationary power equipment (*e.g.*, generators, canes), and gas-powered equipment with tanks larger than five gallons.

ii. Store and fuel equipment in staging areas after daily use.
iii. Inspect daily for fluid leaks before leaving the vehicle staging area for operation.
iv. Thoroughly clean equipment before operation below ordinary high water or within 50 feet of any natural water body or areas that drain directly to streams or wetlands and as often as necessary during operation to remain grease free.

c. **Temporary access roads –** Existing roadways will be used whenever possible. Minimize the number of temporary access roads and travel paths to lessen soil disturbance and compaction and impacts to vegetation. Temporary access roads will not be built on slopes where grade, soil, or other features suggest a likelihood of excessive erosion or failure. When necessary, temporary access roads will be obliterated or revegetated. Temporary roads in wet or flooded areas will be restored by the end of the applicable in-water work period. Construction of new permanent roads is not permitted.

d. **Stream crossings –** Minimize number and length of stream crossings. Such crossings will be at right angles and avoid potential spawning areas to the greatest extent possible. Stream crossings shall not increase the risk of channel re-routing at low and high water conditions. After project completion, temporary stream crossings will be abandoned and the stream channel and banks restored.

e. **Work from top of bank –** To the extent feasible, heavy equipment will work from the top of the bank, unless work instream would result in less damage to the aquatic ecosystem.

f. **Timely completion –** Minimize time in which heavy equipment is in stream channels, riparian areas, and wetlands. Complete earthwork (including drilling, excavation, dredging, filling and compacting) as quickly as possible. During excavation, stockpile native streambed materials above the bankfull elevation, where it cannot reenter the stream, for later use.

18. Site Restoration

a. **Initiate rehabilitation –** Upon project completion, rehabilitate all disturbed areas in a manner that results in similar or better than pre-work conditions through removal of project related waste, spreading of stockpiled materials (soil, LW, trees, *etc.*) seeding, or planting with local native seed mixes or plants.

b. **Short-term stabilization –** Measures may include the use of non-native sterile seed mix (when native seeds are not available), weed-free certified straw, jute matting, and other similar techniques. Short-term stabilization measures will be maintained until permanent erosion control measures are effective. Stabilization measures will be instigated within three days of construction completion.

c. **Revegetation –** Replant each area requiring revegetation prior to or at the beginning of the first growing season following construction. Achieve re-establishment of vegetation in disturbed areas to at least 70% of pre-project levels within three years. Use an appropriate mix of species that will achieve establishment and erosion control objectives, preferably forb, grass, shrub, or tree species native to the project area or region and appropriate to the site. Barriers will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

d. **Planting manuals –** All riparian plantings shall follow Forest Service direction described in the Regional letter to Units, Use of Native and Nonnative Plants on National Forests and Grasslands May 2006 (Final Draft), and or BLM Instruction Memorandum No. OR-2001-014, Policy on the Use of Native Species Plant Material.

e. **Decompact soils –** Decompact soil by scarifying the soil surface of roads and paths, stream crossings, staging, and stockpile areas so that seeds and plantings can root.

19. Monitoring – Monitoring will be conducted by Action Agency staff, as appropriate for that project, during and after a project to track effects and compliance with this opinion.

a. **Implementation**

i. Visually monitor during project implementation to ensure effects are not greater (amount, extent) than anticipated and to contact Level 1 representatives if problems arise.

ii. Fix any problems that arise during project implementation.

iii. Regular biologist/hydrologist coordination if biologist/hydrologist is not always on site to ensure contractor is following all stipulations.

b. **401 Certification –** To minimize short-term degradation to water quality during project implementation, follow current 401 Certification provisions of the Federal Clean Water Act for maintenance or water quality standards described by the following: Oregon Department of Environmental Quality (Oregon BLM, Forest Service, and BIA); Washington Department of Ecology (Washington BLM); and the Memorandum of Understanding between the Washington Department of Fish and Wildlife and Forest Service regarding Hydraulic Projects Conducted by Forest Service, Pacific Northwest Region (WDFW and USDA-Forest Service 2012); California, Idaho, or Nevada 401 Certification protocols (BLM and Forest Service).

c. **Post project –** A post-project review shall be conducted after winter and spring high flows.

i. For each project, conduct a walk through/visual observation to determine if there are post-project affects that were not considered during consultation. For fish passage and revegetation projects, monitor in the following manner:

ii. Fish Passage Projects – Note any problems with channel scour or bedload deposition, substrate, discontinuous flow, vegetation establishment, or invasive plant infestation.

iii. Revegetation – For all plant treatment projects, including site restoration, monitor for and remove invasive plants until native plants become established.

iv. In cases where remedial action is required, such actions are permitted without additional consultation if they use relevant PDC and aquatic conservation measures and the effects of the action categories are not exceeded.

20. Work Area Isolation, Surface Water Withdrawals, and Fish Capture and Release – Isolate the construction area and remove fish from a project site for projects that include concentrated and major excavation at a single location within the stream channel. This condition will typically apply to the following aquatic restoration categories: Fish Passage Restoration; Dam, Tidegate, and Legacy Structure Removal; Channel Reconstruction/Relocation.

a. **Isolate capture area –** Install block nets at up and downstream locations outside of the construction zone to exclude fish from entering the project area. Leave nets secured to the stream channel bed and banks until construction activities within the stream channel are complete. If block nets or traps remain in place more than one day, monitor the nets and or traps at least on a daily basis to ensure they are secured to the banks and free of organic accumulation and to minimize fish predation in the trap.

b. **Capture and release –** Fish trapped within the isolated work area will be captured and released as prudent to minimize the risk of injury, then released at a safe release site, preferably upstream of the isolated reach in a pool or other area that provides cover and flow refuge. Collect fish in the best manner to minimize potential stranding and stress by seine or dip nets as the area is slowly dewatered, baited minnow traps placed overnight, or electrofishing (if other options are ineffective). Fish must be handled with extreme care and kept in water the maximum extent possible during transfer procedures. A healthy environment for the stressed fish shall be provided—large buckets (five-gallon minimum to prevent overcrowding) and minimal handling of fish. Place large fish in buckets separate from smaller prey-sized fish. Monitor water temperature in buckets and well-being of captured fish. If buckets are not being immediately transported, use aerators to maintain water quality. As rapidly as possible, but after fish have recovered, release fish. In cases where the stream is intermittent upstream, release fish in downstream areas and away from the influence of the construction. Capture and release will be supervised by a fishery biologist experienced with work area isolation and safe handling of all fish.

c. **Electrofishing –** Use electrofishing only where other means of fish capture may not be feasible or effective. If electrofishing will be used to capture fish for salvage, NMFS's electrofishing guidelines will be followed (NMFS 2000).[4]

   i. Reasonable effort should be made to avoid handling fish in warm water temperatures, such as conducting fish evacuation first thing in the morning, when the water temperature would likely be coolest. No electrofishing should occur when water temperatures are above 18ºC or are expected to rise above this temperature prior to concluding the fish capture.

   ii. If fish are observed spawning during the in-water work period, electrofishing shall not be conducted in the vicinity of spawning fish or active redds.

[4] *Anadromous Salmonid Passage Facility Design* guidelines are available from the NMFS Northwest Region, Protected Resources Division in Portland, Oregon. (http://www.nwr.noaa.gov/ESA-Salmon-Regulations-Permits/4d-Rules/upload/electro2000.pdf).

iii. Only Direct Current (DC) or Pulsed Direct Current shall be used.
iv. Conductivity <100, use voltage ranges from 900 to 1100. Conductivity from 100 to 300, use voltage ranges from 500 to 800. Conductivity greater than 300, use voltage to 400.
v. Begin electrofishing with minimum pulse width and recommended voltage and then gradually increase to the point where fish are immobilized and captured. Turn off current once fish are immobilized.
vi. Do not allow fish to come into contact with anode. Do not electrofish an area for an extended period of time. Remove fish immediately from water and handle as described above (PDC 20b). Dark bands on the fish indicate injury, suggesting a reduction in voltage and pulse width and longer recovery time.
vii. If mortality is occurring during salvage, immediately discontinue salvage operations (unless this would result in additional fish mortality), reevaluate the current procedures, and adjust or postpone procedures to reduce mortality.

d. **Dewater construction site –**When dewatering is necessary to protect species or critical habitat, divert flow around the construction site with a coffer dam (built with non-erosive materials), taking care to not dewater downstream channels during dewatering. Pass flow and fish downstream with a by-pass culvert or a water-proof lined diversion ditch. Diversion sandbags can be filled with material mined from the floodplain as long as such material is replaced at end of project. Small amounts of instream material can be moved to help seal and secure diversion structures. If ESA listed-fish may be present and pumps are required to dewater, the intake must have a fish screen(s) and be operated in accordance with NMFS fish screen criteria described below (in part e.iv) of this section. Dissipate flow energy at the bypass outflow to prevent damage to riparian vegetation or stream channel. If diversion allows for downstream fish passage, place diversion outlet in a location to promote safe reentry of fish into the stream channel, preferably into pool habitat with cover. Pump seepage water from the de-watered work area to a temporary storage and treatment site or into upland areas and allow water to filter through vegetation prior to reentering the stream channel.[5]

e. **Surface water withdrawals**

i. Surface water may be diverted to meet construction needs, but only if developed sources are unavailable or inadequate. Where ESA-listed fish may be present, diversions may not exceed 10% of the available flow and fish screen(s) will be installed, operated, and maintained according to NMFS's fish screen criteria (NMFS 2011e).
ii. For the dewatering of a work site to remove or install culverts, bridge abutments *etc.*, if ESA-listed fish may be present, a fish screen that meets criteria specified by NMFS (2011e) must be used on the intake to avoid juvenile fish entrainment. If ESA-listed salmon, steelhead, eulachon, or green sturgeon may be present, the Action Agencies will ensure that the

[5] To the extent possible, incorporate measures to protect lamprey. For instructions on how to dewater areas occupied by lamprey, see Best Management Practices to Minimize Adverse Effects to Pacific Lamprey, *Entosphenus tridentatus* (2010).

fish screen design is reviewed and approved by NMFS for consistency with NMFS (2011e) criteria if the diversion (gravity or pump) is at a rate greater than 3 cfs. NMFS approved fish screens have the following specifications: a) An automated cleaning device with a minimum effective surface area of 2.5 square feet per cfs, and a nominal maximum approach velocity of 0.4 feet per second (fps), or no automated cleaning device, a minimum effective surface area of 1 square foot per cfs, and a nominal maximum approach rate of 0.2 fps; and b) a round or square screen mesh that is no larger than 2.38 mm (0.094 inches) in the narrow dimension, or any other shape that is no larger than 1.75 mm (0.069 inches) in the narrow dimension.

f. **Stream re-watering –** Upon project completion, slowly re-water the construction site to prevent loss of surface water downstream as the construction site streambed absorbs water and to prevent a sudden release of suspended sediment. Monitor downstream during re-watering to prevent stranding of aquatic organisms below the construction site.

33. **Non-native Invasive Plant Control** includes manual, mechanical, biological, and chemical methods to remove invasive non-native plants within Riparian Reserves, Riparian Habitat Conservation Areas, or equivalent and adjacent uplands. In monoculture areas (*e.g.*, areas dominated by black berry or knotweed) heavy machinery can be used to help remove invasive plants. This activity is intended to improve the composition, structure, and abundance of native riparian plant communities important for bank stability, stream shading, LW, and other organic inputs into streams, all of which are important elements to fish habitat and water quality. Manual and hand-held equipment will be used to remove plants and disperse chemical treatments. Heavy equipment, such as bulldozers, can be used to remove invasive plants, primarily in areas with low slope values. (Invasive plant treatments included in this opinion are to serve the Action Agencies' administrative units until such units complete a local or provincial consultation for this activity type.)

a. **Project extent –** Non-native invasive plant control projects will not exceed 10% of acres within a Riparian Reserve under the BLM Resource Management Plan (USDI BLM 2016) within a 6^{th} HUC/year.

b. **Manual methods –** Manual treatments are those done with hand tools or hand held motorized equipment. These treatments typically involve a small group of people in a localized area. Vegetation disturbance varies from cutting or mowing to temporarily reduce the size and vigor of plants to removal of entire plants. Soil disturbance is minimized by managing group size and targeting individual plants.

c. **Mechanical methods –** Mechanical treatments involve the use of motorized equipment and vary in intensity and impact from mowing to total vegetation removal and soil turnover (plowing and seed bed preparation). Mechanical treatments reduce the number of people treating vegetation. Impacts could be lessened by minimizing the use of heavy equipment in riparian areas, avoiding treatments that create bare soil in large or extensive areas, reseeding and mulching following treatments, and avoiding work when soils are wet and subject to compaction.

d. **Biological methods –** Release of traditional host specific biological control agents (insects and pathogens) consists of one or two people depositing agents on target vegetation. This results in minimal impact to soils and vegetation from the actual release. Over time, successful biological control agents will reduce the size and vigor of host noxious weeds with minimal or no impact to other plant species.

e. **Chemical methods –** Invasive plants, including state-listed noxious weeds, are particularly aggressive and difficult to control and may require the use of herbicides for successful control and restoration of riparian and upland areas. Herbicide treatments vary in impact to vegetation from complete removal to reduced vigor of specific plants. Minimal impacts to soil from compaction and erosion are expected.

   i. **General Guidance**

      1. Use herbicides only in an integrated weed or vegetation management context where all treatments are considered and various methods are used individually or in concert to maximize the benefits while reducing undesirable effects.
      2. Carefully consider herbicide impacts to fish, wildlife, non-target native plants, and other resources when making herbicide choices.
      3. Treat only the minimum area necessary for effective control. Herbicides may be applied by selective, hand-held, backpack, or broadcast equipment in accordance with state and federal law and only by certified and licensed applicators to specifically target invasive plant species.
      4. Herbicide application rates will follow label direction, unless site-specific analysis determines a lower maximum rate is needed to reduce non-target impacts.
      5. An herbicide safety/spill response plan is required for all projects to reduce the likelihood of spills, misapplication, reduce potential for unsafe practices, and to take remedial actions in the event of spills. Spill plan contents will follow agency direction.
      6. Pesticide applicator reports must be completed within 24 hours of application.

   ii. **Herbicide active ingredients –** Active ingredients are restricted to the following (some common trade names are shown in parentheses; use of trade names does not imply endorsement by the US government):[6]

      1. aminopyralid (*e.g.*, *terrestrial*: Milestone VM)
      2. chlorsulfuron (*e.g.*, *terrestrial*: Telar, Glean, Corsair)
      3. clopyralid (*e.g.*, *terrestrial*: Transline)
      4. dicamba (*e.g.*, *terrestrial*: Vanquish, Banvel)
      5. diflufenzopyr + dicamba (*e.g.*, *terrestrial*: Overdrive)
      6. glyphosate (*e.g.*, *aquatic*: Aquamaster, AquaPro, Rodeo, Accord)
      7. imazapic (*e.g.*, *terrestrial*: Plateau)
      8. imazapyr (*e.g.*, *aquatic*: Habitat; *terrestrial*: Arsenal, Chopper)

[6] The use of trade, firm, or corporation names in this opinion is for the information and convenience of the action agency and applicants and does not constitute an official endorsement or approval by the U.S. Department of Commerce or NMFS of any product or service to the exclusion of others that may be suitable.

9. metsulfuron methyl (*e.g.*, *terrestrial*: Escort)
10. picloram (*e.g.*, *terrestrial*: Tordon, Outpost 22K)
11. sethoxydim (*e.g.*, *terrestrial*: Poast, Vantage)
12. sulfometuron methyl (*e.g.*, *terrestrial*: Oust, Oust XP)
13. triclopyr (*e.g.*, *aquatic*: Garlon 3A, Tahoe 3A, Renovate 3, Element 3A; *terrestrial*: Garlon 4A, Tahoe 4E, Pathfinder II)
14. 2,4-D (*e.g.*, *aquatic*: 2,4-D Amine, Clean Amine; *terrestrial*: Weedone, Hi-Dep)

iii. **Herbicide adjuvants –** When recommended by the label, an approved aquatic surfactant would be used to improve uptake. When aquatic herbicides are required, the only surfactants and adjuvants permitted are those allowed for use on aquatic sites, as listed by the Washington State Department of Ecology: http://www.ecy.wa.gov/programs/wq/pesticides/regpesticides.html. (Oregon Department of Agriculture also often recommends this list for aquatic site applications). The surfactants R-11, Polyethoxylated tallow amine (POEA), and herbicides that contain POEA (*e.g.*, Roundup) will not be used.

iv. **Herbicide carriers –** Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil.

v. **Herbicide mixing –** Herbicides will be mixed more than 150 feet from any natural waterbody to minimize the risk of an accidental discharge. Impervious material will be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling. Spray tanks shall be washed further than 300 feet away from surface water. All hauling and application equipment shall be free from leaks and operating as intended.

vi. **Herbicide application methods** – Liquid forms of herbicides will be applied as follows:

1. Broadcast spraying using booms mounted on ground-based vehicles (this consultation does not include aerial applications).
2. Spot spraying with hand held nozzles attached to back pack tanks or vehicles and hand-pumped sprayers to apply herbicide directly onto small patches or individual plants.
3. Hand/selective through wicking and wiping, basal bark, frill ("hack and squirt"), stem injection, or cut-stump.
4. Dyes or colorants, (*e.g.*, Hi-Light, Dynamark) will be used to assist in treatment assurance and minimize over-spraying within 100 feet of live water.

vii. **Minimization of herbicide drift and leaching –** Herbicide drift and leaching will be minimized as follows:

1. Do not spray when wind speeds exceed 10 miles per hour to reduce the likelihood of spray/dust drift. Winds of 2 mph or less are indicative of air inversions. The applicator must confirm the absence of an inversion before proceeding with the application whenever the wind speed is 2 mph or less.

2. Be aware of wind directions and potential for herbicides to affect aquatic habitat area downwind.
3. Keep boom or spray as low as possible to reduce wind effects.
4. Avoid or minimize drift by utilizing appropriate equipment and settings (*e.g.*, nozzle selection, adjusting pressure, drift reduction agents). Select proper application equipment (*e.g.*, spray equipment that produces 200-800 micron diameter droplets [Spray droplets of 100 microns or less are most prone to drift]).
5. Follow herbicide label directions for maximum daytime temperature permitted (some types of herbicides volatilize in hot temperatures).
6. Do not spray during periods of adverse weather conditions (snow or rain imminent, fog, *etc.*). Wind and other weather data will be monitored and reported for all pesticide applicator reports.
7. Herbicides shall not be applied when the soil is saturated or when a precipitation event likely to produce direct runoff to fish-bearing waters from a treated site is forecasted by NOAA National Weather Service or other similar forecasting service within 48 hours following application. Soil-activated herbicides can be applied as long as label is followed. Do not conduct any applications during periods of heavy rainfall.

viii. **Herbicide buffer distances –** The following no-application buffers—which are measured in feet and are based on herbicide formula, stream type, and application method—will be observed during herbicide applications (Table 4). Herbicide applications based on a combination of approved herbicides will use the most conservative buffer for any herbicide included. Buffer widths are measured as map distance perpendicular to the bankfull for streams, the upland boundary for wetlands, or the upper bank for roadside ditches.

Aquatic Herbicides

In addition to the terrestrial herbicide applications, the BLM would implement integrated invasive plant management for aquatic infestations. Aquatic infestations will be treated with the same four herbicides used under ARBO II (NMFS 2013a) (2,4-D amine, glyphosate, imazapyr, and triclopyr BEE and TEA), but unlike ARBO II, the BLM proposes to use these herbicides over-water, but above the waterline (in addition to over land). This includes vegetation that is within a waterbody, but only the exposed part of the plant above the surface of the water would be treated. In addition, fluridone will be applied directly to water, but only in closed aquatic systems such as ponds and lakes that do not flow into streams during the treatment window.

There is less than one acre of aquatic invasive species currently known to occur on the NOD, all within the Siuslaw Field Office, including three infestations of parrot feather on Hult Pond and an emergent infestation of yellow flag iris on Kelly Creek, a tributary to the South Fork Siuslaw River. These aquatic invasive plants would be a high priority for treatment as control programs are most effective if they can eradicate the infestation while it is still in the introduction phase before these invasive plant species become established on the NOD and spread [(see the Prioritizing Areas for Treatment section in Appendix B) (USDI 2010)]. These aquatic plant species would likely be treated as soon as feasible. [See Tables C-3 and C-14 in Appendix C of the EA (BLM 2018) for further information about the exact treatment methods that the BLM would use on these species]. Map A-2, Aquatic Invasive Species in the EA (BLM 2018) shows the locations of these infestations on the NW Oregon District.

Manual and Mechanical

The non-herbicide invasive plant control methods available under the proposed action are manual or mechanical. Manual methods" include hand-pulling, digging, grubbing, solarization (plastic covering over the vegetation). "Mechanical methods" include mowing, tilling or disking, string trimmers, propane torch, seeding and planting, prescribed fire, biological control agents (generally insects), and targeted grazing by goats or sheep.

Treatment options would vary based on soil type, infestation size, neighboring vegetation, and weather conditions. In addition to treatments shown on the Treatment Key, the BLM would continue to use competitive seeding and planting and prescribed fire, as appropriate. Competitive seeding and planting would occur on an average of 110 acres/year to prevent the introduction and spread of invasive plant infestations, for an average 42 sites/year, with typical sites being smaller than 1 acre. Prescribed fire would occur on an average of 400 acres of invasive plants annually. These prescribed fires could be broadcast fires across monocultures or areas where all species are invasive, or machine or hand piled and burned, a process that is generally limited to woody species.

For purposes of this proposed action, targeted grazing is the purposeful application of goats or sheep at a determined season, duration, and intensity, to accomplish defined vegetation or landscape objectives (ASI 2006). Cattle or horse grazing are not part of this proposed action. The basic goal of targeted goat or sheep grazing is to give the desired plants a competitive advantage over the target invasive plant or plants. In general, goats prefer to eat trees, shrubs, and broadleaf plants, and sheep prefer broadleaf plants and grass. Goat or sheep grazing can be seasonally timed for when the target plant is most palatable to them and to minimize effects to non-target plants and surrounding resources. Typically, a full-time herder or fencing, as well as appropriate water, salt, and other mineral supplements, and close monitoring of animals and vegetation are required to keep the goats or sheep focused on the target areas and species. Employing goat or sheep grazing prescriptions may be particularly useful in areas with limited access, steep slopes, or where the most effective herbicide for a particular plant species cannot be applied, e.g., a non-aquatic herbicide application near water. Although targeted grazing with goats or sheep can reduce invasive plant abundance or vigor at a particular site, grazing rarely, if ever, eradicates invasive plants. As with many other treatments, targeted grazing with goats or sheep can be most effective when used in combination with other treatments (USDI 2010a). The BLM will ensure that animals will either be fenced, or monitored by a herder to prevent animals from accessing streams, and other water bodies.

Standard Operating Procedures and Project Design Features

There are numerous required standard operating procedures (SOPs), and project design features (PDFs) that have been developed to protect water resources, riparian and aquatic habitat, and aquatic organisms, and are listed in full in Appendix D of the EA (BLM 2018). Some of the SOPs or PDFS relevant to this proposed action include:

- For treatment of aquatic vegetation, (1) Treat only that portion of the aquatic system necessary to meet vegetation management objectives, (2) use the appropriate application method to minimize potential for injury to desirable vegetation and aquatic organisms, and (3) follow water use restrictions on the herbicide label.
- Minimize treatments near fish-bearing water bodies during periods when fish are in life stages most sensitive to the herbicide(s) used, and use spot treatments rather than broadcast treatments.
- Conduct mixing and loading operations in an area where an accidental spill would not contaminate an aquatic body, and at least 150 feet from water bodies.
- Do not rinse spray tanks within 300 feet of water bodies.
- Consider the proximity of application areas to salmonid habitat and the possible effects of herbicides on riparian and aquatic vegetation. Maintain buffer zones around salmonid-bearing streams (Table 2).
- When using targeted grazing by goats or sheep, their access to streams for crossing or for water will be limited to areas on bedrock or with stabilized banks and streambed to minimize trampling damage, sediments entering water, and other potential for damage to fish habitat. A full-time herder, or temporary stream exclosure fencing is required to keep the grazing focused on the target areas and species, and out of the stream.
- When using prescribed fire, maintain vegetated buffers near fish-bearing streams to minimize soil erosion and soil runoff into streams.

In addition, projects that have the potential to harm ESA-listed fish species or other aquatic species habitat require pre-project clearances, including review for potential habitat or project site surveys (USDI 2008b). Field office botanists will develop the treatment plan in coordination with an interdisciplinary team of staff including, a fish biologist, and hydrologist.

The BLM proposes the following to further reduce effects on fish and other aquatic organisms under the proposed action:

- In waterbodies that contain ESA-listed fish species or critical habitat, follow all Project Design Criteria developed in coordination with NMFS (Table 2.)
- Delay treating side channels and connected backwaters until they are disconnected from the mainstem river or during the period of lowest flow.
- When using aquatic 2,4-D amine, glyphosate, imazapyr, or triclopyr BEE and TEA in closed aquatic systems, implement a phased treatment by treating less than 50 percent of

the surface area of the pond at a time to reduce the likelihood of all of the aquatic plants dying at the same time, which would result in a rapid depletion of dissolved oxygen.

Table 2. Criteria for application of aquatic and terrestrial herbicides applying to projects that have the potential to harm ESA-listed fish species.

Herbicide	Perennial Streams and Wetlands, and Intermittent Streams and Roadside Ditches with flowing or standing water present			Dry Intermittent Streams, Dry Intermittent Wetlands, Dry roadside Ditches		
	Broadcast spraying	Spot spraying	Hand selective	Broadcast spraying	Spot spraying	Hand selective
Labeled for Aquatic Use						
Aquatic Glyphosate	100	waterline	waterline	50	0	0[7]
Aquatic Imazapyr	100	waterline	waterline	50	0	0[2]
Aquatic triclopyr TEA	Not Allowed	15	waterline	Not Allowed	0	0[2]
Aquatic 2,4-D (amine)	100	waterline	waterline	50	0	0
Low Risk to Aquatic Organisms						
Aminopyralid	100	waterline	waterline	50	0	0
Dicamba	100	15	15	50	0	0
Dicamba + diflufenzopyr	100	15	15	50	0	0
Imazapic	100	15	bankfull elevation	50	0	0
Clopyralid	100	15	bankfull elevation	50	0	0
Metsulfuron-methyl	100	15	bankfull elevation	50	0	0
Moderate Risk to Aquatic Organisms						
Imazapyr	100	15	bankfull elevation	50	15	bankfull elevation[2]
Sulfometuron-methyl	100	15	5	50	15	bankfull elevation
Chlorsulfuron	100	15	bankfull elevation	50	15	bankfull elevation
High Risk to Aquatic Organisms						
Triclopyr BEE	Not Allowed	150	150	Not Allowed	150	150
Picloram	100	50	50	100	50	50
Sethoxydim	100	50	50	100	50	50
2,4-D (ester)	100	50	50	100	50	50[2]

The proposed treatment methods and associated SOPs, PDFs, and PDCs would also be available as BLM supports and implements cooperative terrestrial and aquatic invasive plant treatments, including those proposed by non-BLM groups on BLM-administered lands and non-federally-managed lands. The proposed action would allow the BLM to carry out and facilitate the implementation of partnership-based terrestrial and aquatic invasive plant management projects on non-federally-managed lands. The BLM would incorporate these projects in Annual Treatment Plans.

Currently, the BLM's invasive plant management program is covered by ESA and EFH consultation provided through ARBO II (NMFS 2013a). The BLM will continue to use many project elements of ARBO II, and we are incorporating these effects by reference. Because the

[7] Under the proposed action, the BLM can hand paint glyphosate, imazapyr, triclopyr, and 2,4-D on the foliage of plants over water, but above the waterline. This will not occur in ESA-listed fish habitat, and will only occur in closed systems.

BLM proposes to use additional methods, and chemicals that were not covered in ARBO II (NMFS 2013a), the analysis in this opinion will focus on the treatment methods not analyzed in ARBO II: Mechanical and manual, and application of herbicides of aquatic invasive plant treatment with 2,4-D amine, fluridone, glyphosate, imazapyr, and triclopyr BEE and TEA; and the terrestrial herbicide applications with fluroxypyr, fluazifop-P-butyl, hexazione, and rimsulfuron. Herbicides available for use under the proposed action are shown in Table 1, above. The BLM proposes to follow the Non-native Invasive Plant Control PDCs in the ARBO II opinion (NMFS 2013a), except for the over-water use of 2,4-D amine, glyphosate, imazapyr, and triclopyr BEE and TEA. Under the proposed action, BLM will only to hand paint these products on the foliage of plants over water, but above the waterline. Use of these products is even further restricted under the proposed action and will not be allowed in ESA-listed fish habitat; hand painting of these products on foliage above the water line will only occur in closed systems where there is no connection to ESA-listed fish habitat.

1.4 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area consists of all the areas where the environmental effects of actions authorized by BLM may occur. This includes all upland, riparian and aquatic areas affected by the proposed action at each site.

All actions funded or carried out under this opinion will occur on Federal lands administered by the BLM, or on eligible adjacent private lands, that are also within the present or historic range of ESA-listed species considered in this opinion and within Northwestern Oregon (Figure 1). The action area includes portions of the Lower Columbia, Lower Columbia-Clatskanie, Lower Deschutes, Upper Deschutes, Lower Columbia-Sandy, Clackamas, Molalla-Pudding, Lower Willamette, Middle Fork Willamette, Middle Willamette, Upper Willamette, Coast Fork Willamette, Tualatin, Wilson-Trask-Nestucca, Nehalem, Necanicum, Yamhill, North Santiam, South Santiam, North Umpqua, Umpqua, McKenzie, Middle Columbia-Hood, Siuslaw, Sitlcoos, Alsea, and Siletz-Yaquina river basins.

Each individual project authorized under this program will have an impact area that exists within the program action area. Individual project-level impact areas include riparian areas, banks, and the stream channel in area extending no more than 150 feet upstream, and 300 feet downstream from the action footprint, where aquatic habitat conditions will be temporarily degraded until revegetation and recovery of plant communities is complete. This estimate is based on an analysis of typical turbidity flux downstream from a nonpoint discharge in a stream with a low flow channel that is greater than 200 feet, although the actual turbidity flux at each project site is likely to be proportionately smaller for streams with a smaller low flow channel width (Rosetta 2005), or may be somewhat greater for project areas that are subject to tidal or coastal scour.

The overall action area is also designated by the Pacific Fishery Management Council (PFMC) as EFH for Pacific Coast salmon (PFMC 2014), or is in an area where environmental effects of the proposed action is likely to adversely affect designated EFH for those species.

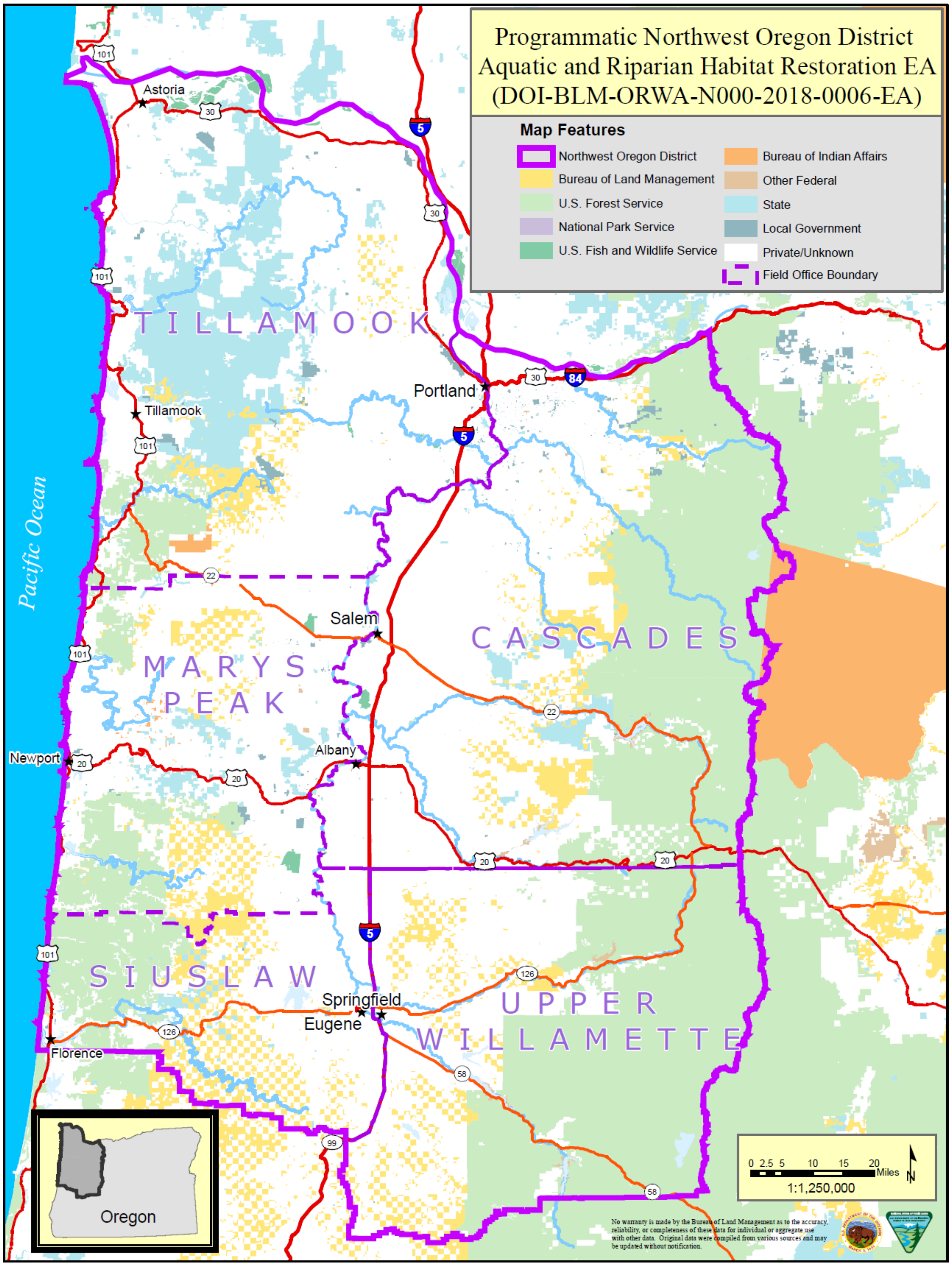

Figure 1. Overview of the action area within each district and field office across the NOD.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and/or an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of" a listed species, which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214).

The designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a ''destruction or adverse modification'' analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.

- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a RPA to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. The largest hydrologic responses are expected to occur in basins with significant snow accumulation, where warming decreases snow pack, increases winter flows, and advances the timing of spring melt (Mote et al. 2014, Mote 2016). Rain-dominated watersheds and those with significant contributions from groundwater may be less sensitive to predicted changes in climate (Tague et al. 2013, Mote et al. 2014).

During the last century, average regional air temperatures in the Pacific Northwest increased by 1-1.4°F as an annual average, and up to 2°F in some seasons (based on average linear increase per decade; Abatzoglou et al. 2014; Kunkel et al. 2013). Warming is likely to continue during the next century as average temperatures are projected to increase another 3 to 10°F, with the largest increases predicted to occur in the summer (Mote et al. 2014). Decreases in summer precipitation of as much as 30% by the end of the century are consistently predicted across climate models (Mote et al. 2014). Precipitation is more likely to occur during October through March, less during summer months, and more winter precipitation will be rain than snow (ISAB 2007; Mote et al. 2013; Mote et al. 2014). Earlier snowmelt will cause lower stream flows in late spring, summer, and fall, and water temperatures will be warmer (ISAB 2007; Mote et al. 2014). Models consistently predict increases in the frequency of severe winter precipitation events (i.e., 20-year and 50-year events), in the western United States (Dominguez et al. 2012). The largest increases in winter flood frequency and magnitude are predicted in mixed rain-snow watersheds (Mote et al. 2014).

Overall, about one-third of the current cold-water salmonid habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (Mantua et al. 2009). Higher temperatures will reduce the quality of available salmonid habitat for most freshwater life stages (ISAB 2007). Reduced flows will make it more difficult for migrating fish to pass physical and thermal obstructions, limiting their access to available habitat (Mantua et al. 2010; Isaak et al. 2012). Temperature increases shift timing of key life cycle events for salmonids and species forming the base of their aquatic foodwebs (Crozier et al. 2011; Tillmann and Siemann 2011; Winder and Schindler 2004). Higher stream temperatures will also cause decreases in dissolved oxygen and may also cause earlier onset of stratification and reduced mixing between layers in lakes and reservoirs, which can also result in reduced oxygen (Meyer et al. 1999; Winder and Schindler 2004, Raymondi et al. 2013). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier et al. 2008; Wainwright and Weitkamp 2013; Raymondi et al. 2013).

As more basins become rain-dominated and prone to more severe winter storms, higher winter stream flows may increase the risk that winter or spring floods in sensitive watersheds will damage spawning redds and wash away incubating eggs (Goode et al. 2013). Earlier peak stream flows will also alter migration timing for salmon smolts, and may flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and reducing smolt survival (McMahon and Hartman 1989; Lawson et al. 2004).

In addition to changes in freshwater conditions, predicted changes for coastal waters in the Pacific Northwest as a result of climate change include increasing surface water temperature, increasing but highly variable acidity, and increasing storm frequency and magnitude (Mote et al. 2014). Elevated ocean temperatures already documented for the Pacific Northwest are highly likely to continue during the next century, with sea surface temperature projected to increase by 1.0-3.7^{o}C by the end of the century (IPCC 2014). Habitat loss, shifts in species' ranges and abundances, and altered marine food webs could have substantial consequences to anadromous, coastal, and marine species in the Pacific Northwest (Tillmann and Siemann 2011, Reeder et al. 2013).

Moreover, as atmospheric carbon emissions increase, increasing levels of carbon are absorbed by the oceans, changing the pH of the water. Acidification also impacts sensitive estuary habitats, where organic matter and nutrient inputs further reduce pH and produce conditions more corrosive than those in offshore waters (Feely et al. 2012, Sunda and Cai 2012).

Global sea levels are expected to continue rising throughout this century, reaching likely predicted increases of 10-32 inches by 2081-2100 (IPCC 2014). These changes will likely result in increased erosion and more frequent and severe coastal flooding, and shifts in the composition of nearshore habitats (Tillmann and Siemann 2011, Reeder et al. 2013). Estuarine-dependent salmonids such as chum and Chinook salmon are predicted to be impacted by significant reductions in rearing habitat in some Pacific Northwest coastal areas (Glick et al. 2007).

Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances, and therefore these species are predicted to fare poorly in warming ocean conditions (Scheuerell and Williams 2005; Zabel et al. 2006). This is supported by the recent observation that anomalously warm sea surface temperatures off the coast of Washington from 2013 to 2016 resulted in poor coho and Chinook salmon body condition for juveniles caught in those waters (NWFSC 2015). Changes to estuarine and coastal conditions, as well as the timing of seasonal shifts in these habitats, have the potential to impact a wide range of listed aquatic species (Tillmann and Siemann 2011, Reeder et al. 2013).

The adaptive ability of these threatened and endangered species is depressed due to reductions in population size, habitat quantity and diversity, and loss of behavioral and genetic variation. Without these natural sources of resilience, systematic changes in local and regional climatic conditions due to anthropogenic global climate change will likely reduce long-term viability and sustainability of populations in many of these ESUs (NWFSC 2015). New stressors generated by climate change, or existing stressors with effects that have been amplified by climate change, may also have synergistic impacts on species and ecosystems (Doney et al. 2012). These conditions will possibly intensify the climate change stressors inhibiting recovery of ESA-listed species in the future

2.2.1 Status of the Species

Table 3, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. The information that informs this summary can be found in recovery plans and status reviews for these species and is incorporated here by reference. These documents are available on the NMFS West Coast Region website (http://www.westcoast.fisheries.noaa.gov/).

Table 3. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion. Acronyms appearing in the table include DPS (Distinct Population Segment), ESU (Evolutionarily Significant Unit), MPG (Multiple Population Grouping), NWFSC (Northwest Fisheries Science Center), and VSP (Viable Salmonid Population).

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River Chinook salmon	Threatened 6/28/05	NMFS 2013b	NWFSC 2015	This ESU comprises 32 independent populations. Twenty-seven populations are at very high risk, 2 populations are at high risk, one population is at moderate risk, and 2 populations are at very low risk Overall, there was little change since the last status review in the biological status of this ESU, although there are some positive trends. Increases in abundance were noted in about 70% of the fall-run populations and decreases in hatchery contribution were noted for several populations. Relative to baseline VSP levels identified in the recovery plan, there has been an overall improvement in the status of a number of fall-run populations, although most are still far from the recovery plan goals.	•Reduced access to spawning and rearing habitat •Hatchery-related effects •Harvest-related effects on fall Chinook salmon •An altered flow regime and Columbia River plume •Reduced access to off-channel rearing habitat •Reduced productivity resulting from sediment and nutrient-related changes in the estuary •Contaminant
Upper Willamette River Chinook salmon	Threatened 6/28/05	NMFS 2011	NWFSC 2015	This ESU comprises seven populations. Five populations are at very high risk, one population is at moderate risk (Clackamas River) and one population is at low risk (McKenzie River). Consideration of data collected since the last status review in 2010 indicates the fraction of hatchery origin fish in all populations remains high (even in Clackamas and McKenzie populations). The proportion of natural origin spawners improved in the North and South Santiam basins, but is still well below identified recovery goals. Abundance levels for five of the seven populations remain well below their recovery goals. Of these, the Calapooia River may be functionally extinct and the Molalla River remains critically low. Abundances in the	•Degraded freshwater habitat •Degraded water quality •Increased disease incidence •Altered stream flows •Reduced access to spawning and rearing habitats •Altered food web due to reduced inputs of microdetritus •Predation by native and non-native species, including hatchery fish •Competition related to introduced salmon and steelhead •Altered population traits due to fisheries and bycatch

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				North and South Santiam rivers have risen since the 2010 review, but still range only in the high hundreds of fish. The Clackamas and McKenzie populations have previously been viewed as natural population strongholds, but have both experienced declines in abundance despite having access to much of their historical spawning habitat. Overall, populations appear to be at either moderate or high risk, there has been likely little net change in the VSP score for the ESU since the last review, so the ESU remains at moderate risk.	
Lower Columbia River coho salmon	Threatened 6/28/05	NMFS 2013b	NWFSC 2015	Of the 24 populations that make up this ESU, 21 populations are at very high risk, 1 population is at high risk, and 2 populations are at moderate risk. Recent recovery efforts may have contributed to the observed natural production, but in the absence of longer term data sets it is not possible to parse out these effects. Populations with longer term data sets exhibit stable or slightly positive abundance trends. Some trap and haul programs appear to be operating at or near replacement, although other programs still are far from that threshold and require supplementation with additional hatchery-origin spawners .Initiation of or improvement in the downstream juvenile facilities at Cowlitz Falls, Merwin, and North Fork Dam are likely to further improve the status of the associated upstream populations. While these and other recovery efforts have likely improved the status of a number of coho salmon populations, abundances are still at low levels and the majority of the populations remain at moderate or high risk. For the Lower Columbia River region land development and increasing human population pressures will likely continue to degrade habitat, especially in	•Degraded estuarine and near-shore marine habitat •Fish passage barriers • Degraded freshwater habitat: Hatchery-related effects •Harvest-related effects •An altered flow regime and Columbia River plume •Reduced access to off-channel rearing habitat in the lower Columbia River •Reduced productivity resulting from sediment and nutrient-related changes in the estuary •Juvenile fish wake strandings •Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				lowland areas. Although populations in this ESU have generally improved, especially in the 2013/14 and 2014/15 return years, recent poor ocean conditions suggest that population declines might occur in the upcoming return years	
Oregon Coast coho salmon	Threatened 6/20/11; reaffirmed 4/14/14	NMFS 2016a	NWFSC 2015	This ESU comprises 56 populations including 21 independent and 35 dependent populations. The last status review indicated a moderate risk of extinction. Significant improvements in hatchery and harvest practices have been made for this ESU. Most recently, spatial structure conditions have improved in terms of spawner and juvenile distribution in watersheds; none of the geographic area or strata within the ESU appear to have considerably lower abundance or productivity. The ability of the ESU to survive another prolonged period of poor marine survival remains in question.	• Reduced amount and complexity of habitat including connected floodplain habitat • Degraded water quality • Blocked/impaired fish passage • Inadequate long-term habitat protection • Changes in ocean conditions
Lower Columbia River steelhead	Threatened 1/5/06	NMFS 2013b	NWFSC 2015	This DPS comprises 23 historical populations, 17 winter-run populations and six summer-run populations. Nine populations are at very high risk, 7 populations are at high risk, 6 populations are at moderate risk, and 1 population is at low risk. The majority of winter-run steelhead populations in this DPS continue to persist at low abundances. Hatchery interactions remain a concern in select basins, but the overall situation is somewhat improved compared to prior reviews. Summer-run steelhead populations were similarly stable, but at low abundance levels. The decline in the Wind River summer-run population is a source of concern, given that this population has been considered one of the healthiest of the summer-runs; however, the most recent abundance estimates suggest that the decline was a single year aberration. Passage programs in the Cowlitz and	Degraded estuarine and nearshore marine habitat •Degraded freshwater habitat •Reduced access to spawning and rearing habitat •Avian and marine mammal predation •Hatchery-related effects •An altered flow regime and Columbia River plume •Reduced access to off-channel rearing habitat in the lower Columbia River •Reduced productivity resulting from sediment and nutrient-related changes in the estuary •Juvenile fish wake strandings •Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				Lewis basins have the potential to provide considerable improvements in abundance and spatial structure, but have not produced self-sustaining populations to date. Even with modest improvements in the status of several winter-run DIPs, none of the populations appear to be at fully viable status, and similarly none of the MPGs meet the criteria for viability.	
Upper Willamette River steelhead	Threatened 1/5/06	NMFS 2011	NWFSC 2015	This DPS has four demographically independent populations. Three populations are at low risk and one population is at moderate risk. Declines in abundance noted in the last status review continued through the period from 2010-2015. While rates of decline appear moderate, the DPS continues to demonstrate the overall low abundance pattern that was of concern during the last status review. The causes of these declines are not well understood, although much accessible habitat is degraded and under continued development pressure. The elimination of winter-run hatchery release in the basin reduces hatchery threats, but non-native summer steelhead hatchery releases are still a concern for species diversity and a source of competition for the DPS. While the collective risk to the persistence of the DPS has not changed significantly in recent years, continued declines and potential negative impacts from climate change may cause increased risk in the near future.	•Degraded freshwater habitat •Degraded water quality •Increased disease incidence •Altered stream flows •Reduced access to spawning and rearing habitats due to impaired passage at dams •Altered food web due to changes in inputs of microdetritus •Predation by native and non-native species, including hatchery fish and pinnipeds •Competition related to introduced salmon and steelhead •Altered population traits due to interbreeding with hatchery origin fish

2.2.1 Status of the Critical Habitat

This section describes the status of designated critical habitat affected by the proposed action by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (*e.g.*, sites with conditions that support spawning, rearing, migration and foraging).

For most salmon and steelhead, NMFS's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NMFS 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

A summary of the status of critical habitats, considered in this opinion, is provided in Table 4, below.

Table 4. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Lower Columbia River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 47 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some, or high potential for improvement. We rated conservation value of HUC5 watersheds as high for 30 watersheds, medium for 13 watersheds, and low for four watersheds.
Upper Willamette River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon containing 56 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 22 watersheds, medium for 16 watersheds, and low for 18 watersheds.
Lower Columbia River coho salmon	2/24/16 81 FR 9252	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 55 occupied watersheds, as well as the lower Columbia River and estuary rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 34 watersheds, medium for 18 watersheds, and low for three watersheds.
Oregon Coast coho salmon	2/11/08 73 FR 7816	Critical habitat encompasses 13 subbasins in Oregon. The long-term decline in Oregon Coast coho salmon productivity reflects deteriorating conditions in freshwater habitat as well as extensive loss of access to habitats in estuaries and tidal freshwater. Many of the habitat changes resulting from land use practices over the last 150 years that contributed to the ESA-listing of Oregon Coast coho salmon continue to hinder recovery of the populations; changes in the watersheds due to land use practices have weakened natural watershed processes and functions, including loss of connectivity to historical floodplains, wetlands and side channels; reduced riparian area functions (stream temperature regulation, wood recruitment, sediment and nutrient retention); and altered flow and sediment regimes (NMFS 2016a). Several historical and ongoing land uses have reduced stream capacity and complexity in Oregon coastal streams and lakes through disturbance, road building, splash damming, stream cleaning, and other activities. Beaver removal, combined with loss of large wood in streams, has also led to degraded stream habitat conditions for coho salmon (Stout et al. 2012)
Lower Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses nine subbasins in Oregon and Washington containing 41 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 28 watersheds, medium for 11 watersheds, and low for two watersheds.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Upper Willamette River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses seven subbasins in Oregon containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 25 watersheds, medium for 6 watersheds, and low for 3 watersheds.

2.3 Environmental Baseline

The “environmental baseline” includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

As described above in the Status of the Species and Critical Habitat sections, factors that limit the recovery of anadromous species considered in this opinion vary with the overall condition of aquatic habitats on private, state, and Federal lands. There are 8,225 miles of water quality limited streams and lakes within the action area, some of which are impaired due to the presence of aquatic invasive plants. Within the action area, many stream and riparian areas have been degraded by the effects of land and water use, including urbanization, road construction, forest management, agriculture, mining, transportation, and water development. Restoration actions within the action area, provide some beneficial effects.

Development activities have contributed to a myriad of related factors within the action area related to the condition of species considered in this opinion. Among the most important of these are changes in stream channel morphology; reduced instream roughness and cover; loss and degradation of off-channel areas, refugia, estuarine rearing habitats, riparian areas, spawning areas, and wetlands; degradation of water quality (*e.g.*, temperature, sediment, dissolved oxygen, contaminants); and blocked fish passage.

The environmental baseline also includes the anticipated impacts of all Federal projects in the action area that have already undergone consultation. This includes, aquatic restoration projects that were completed under the 2013 ARBO II biological opinion (NMFS 2013), routine actions and maintenance activities under the RAMBO biological opinion (NMFS 2018), BLM Resource Management Plan for Western Oregon (NMFS 2016b), and the subsequent timber sale and associated land management activities under the BLM Forest Management Program for Western Oregon biological opinion (NMFS 2018), the Willamette River Basin Flood Control Project opinion (NMFS 2008), the FEMA National Flood Insurance Program in the State of Oregon opinion (NMFS 2016c). From 2013 to 2018, NMFS conducted eight formal consultations, and eight informal consultations with the BLM in Western Oregon. This is in addition to the four biological opinions mentioned above.

AREMP

The Northwest Forest Plan (NWFP) Aquatic and Riparian Effectiveness Monitoring Program (AREMP) evaluates the environmental outcomes of management actions under the NWFP. AREMP assesses watershed condition status and trend at two different scales, stream and upslope/riparian. Stream condition is based on surveys in watersheds randomly selected from the NWFP area; it describes current condition for fish and other aquatic biota. Upslope/riparian condition is evaluated based on GIS and remote sensing data.

The AREMP work group prepared a report that analyzes monitoring results for the BLM Proposed Resource Management Plan area (USDA FS and USDI BLM 2015), now managed under the ROD/RMPs, which includes the ESA action area for this proposed action. These monitoring results are representative of the smaller subset of areas that will be managed under the BLM Integrated Invasive Plant Management. This is because the monitoring results are focused on the stream conditions and riparian area conditions, and our focus for analysis of effects is on the stream, and riparian areas. The AREMP monitoring report showed that across the BLM lands overall watershed condition, as measured by a variety of indicators, are remaining steady (large wood, substrate), decreasing (temperature) or improving (macroinvertebrates) (USDA FS and USDI BLM 2015).

Similar to the first round of AREMP results, low scores in the area now managed under the ROD/RMPs were primarily driven by poor pool scores, particularly during the second rotation of AREMP monitoring. Substrate and wood scores remained unchanged which is a slight deviation from the overall NWFP results that show an increasing trend in mean substrate distribution scores between rotations. Lower pool scores suggest that pool tail crests, an area important for spawning salmonids, have more fine sediment than expected based on environmentally similar reference condition. High levels of fine sediment indicate a disturbance in the system, such as increased sediment delivery from riparian roads and landslides. Upslope/riparian processes that contribute the most to lower condition were riparian and fish passage. Both processes are largely dependent on inputs from roads, further suggesting that road impacts may be affecting streams here.

The Status of the Species section, above describes the overall status of species covered in this opinion. Below is species status information for the populations present in the action area.

LCR Chinook Salmon

Table 5 shows the baseline, and persistence probability for each LCR Chinook salmon population in the action area.

Table 5. Baseline and abundance of LCR Chinook Salmon Populations in the action area. Net = overall persistence probability of the population. Abundance and probability (A&P), very low (VL), low (L), moderate (M), high (H), very high (VH)(NMFS 2013b).

Population (Watershed)	A&P	Diversity	Spatial Structure	Net
Clackamas River	VL	L	VH	M
Sandy River	M	M	M	M
Big Creek	VL	L	H	VL
Youngs Bay	L	L	VH	L
Clatskanie River	VL	L	VH	VL
Scappoose	L	L	H	L

UWR Chinook Salmon

Table 6 shows the baseline, and overall extinction risk for UWR Chinook salmon populations in the action area.

Table 6 Scores for the key elements [abundance and probability (A&P), diversity, and spatial structure] used to determine current overall viability risk for UWR Chinook salmon populations in the action area (ODFW and NMFS 2011). All populations are in the Western Cascade Range ecological subregion. Risk ratings included very low (VL), low (L), moderate (M), high (H), and very high (VH). The current general directions of population viability scores based on data reviewed in the 2015 status update are also shown (NWFSC 2015).

Population (Watershed)	A&P	Diversity	Spatial Structure	Overall Extinction Risk
Clackamas River	M	M	L	M
Molalla River	VH	H	H	VH
North Santiam River	VH	H	H	VH
South Santiam River	VH	M	M	VH
Calapooia River	VH	H	VH	VH
McKenzie River	VL	M	M	L
Middle Fork Willamette River	VH	H	H	VH

LCR Coho

Table 7 shows the baseline, and overall persistence probability for each LCR coho population in the action area.

Table 7. Baseline and persistence probability of LCR coho populations in the action area. Net = overall persistence probability of the population. Abundance and probability (A&P), very low (VL), low (L), moderate (M), high (H), and very high (VH).

Population (Watershed)	A&P	Diversity	Spatial Structure	Net
Youngs Bay	VL	VL	VH	VL
Big Creek	VL	L	H	VL
Scappoose Creek	M	M	H	M
Clackamas River	M	H	VH	M
Clatskanie River	L	M	VH	L
Sandy River	VL	M	H	VL
Lower Gorge (OR)	VL	VL	M	VL
Upper Gorge/Hood (OR)	VL	L	VH	VL

OC Coho

A 2010 BRT (Stout et al. 2012) noted significant improvements in hatchery and harvest practices had been made, although, harvest and hatchery reductions have changed the population dynamics of the ESU. Recent re-evaluation of hatchery influence on diversity criteria were positive with even the lowest ranked populations showing improvement since the previous assessment (NWFSC 2015). Additional ESU diversity criteria were not updated in 2015 although the recent increases in abundance and diversity across all the strata suggest that ESU diversity has not decreased since 2012 (NWFSC 2015).

Abundance and Productivity. It has not been demonstrated that productivity during periods of poor marine survival is now adequate to sustain the ESU. Recent increases in adult escapement do not provide strong evidence that the century-long downward trend has changed. There is concern that increased abundances are being incorrectly credited to stream restoration activities when the increases are a result of recent high marine survival. When future conditions are taken into account, the OC coho salmon ESU, as a whole, is at moderate risk of extinction, but the recent risk trend is stable and improving (Stout et al. 2012, NWFSC 2015). Table 8 shows the population types of OC coho in the action area.

Table 8. OC coho salmon populations in the action area. Population types included functionally independent (FI), potentially independent (PI) and dependent populations (D) (McElhany et al. 2000; Lawson et al. 2007).

Stratum	Population	Type	Stratum	Population	Type
North Coast	Necanicum River	PI	Mid-Coast (cont.)	Yaquina River	FI
	Ecola Creek	D		Theil Creek	D
	Arch Cape Creek	D		Beaver Creek	PI
	Short Sands Creek	D		Alsea River	FI
	Nehalem River	FI		Big Creek (Alsea)	D
	Spring Creek	D		Vingie Creek	D
	Watseco Creek	D		Yachats River	D
	Tillamook Bay	FI		Cummins Creek	D
	Netarts Bay	D		Bob Creek	D
	Rover Creek	D		Tenmile Creek	D
	Sand Creek	D		Rock Creek	D
	Nestucca River	FI		Big Creek (Siuslaw)	D
	Neskowin Creek	D		China Creek	D
Mid-Coast	Salmon River	PI		Cape Creek	D
	Devils Lake	D		Berry Creek	D
	Siletz River	FI		Siuslaw River	FI
	Schoolhouse Creek	D	Lakes	Siltcoos Lake	PI
	Fogarty Creek	D		Sutton Creek	D
	Depoe Bay	D	Umpqua	Lower Umpqua River	FI
	Rocky Creek	D		Middle Umpqua River	FI
	Spencer Creek	D		North Umpqua River	FI
	Wade Creek	D		South Umpqua River	FI
	Coal Creek	D	Mid-South Coast	Threemile Creek	D
	Moolack Creek	D		Johnson Creek	D
	Big Creek (Yaquina)	D		Twomile Creek	D

LCR Steelhead

Table 9 shows the baseline, and overall extinction risk for LCR steelhead populations in the action area.

Table 9. Scores for the key elements [abundance and productivity (A&P), diversity, and spatial structure] used to determine current overall viability risk for UWR steelhead populations in the action area (ODFW and NMFS 2011). All populations are in the Western Cascade Range ecological subregion. Risk ratings included very low (VL), low (L), moderate (M), high (H), and very high (VH).

Population (Watershed)	A&P	Diversity	Spatial Structure	Overall Extinction Risk
Molalla River	VL	M	M	L
North Santiam River	VL	M	H	L
South Santiam River	VL	M	M	L
Calapooia River	M	M	VH	M

UWR Steelhead

Table 10 shows the baseline, and overall extinction risk for UWR steelhead populations in the action area.

Table 10. Scores for the key elements (A&P, diversity, and spatial structure) used to determine current overall viability risk for UWR steelhead (ODFW and NMFS 2011). All populations are in the Western Cascade Range ecological subregion. Risk ratings included very low (VL), low (L), moderate (M), high (H), and very high (VH).

Population (Watershed)	A&P	Diversity	Spatial Structure	Overall Extinction Risk
Molalla River	VL	M	M	L
North Santiam River	VL	M	H	L
South Santiam River	VL	M	M	L
Calapooia River	M	M	VH	M

2.5 Effects of the Action

Under the ESA, “effects of the action” means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

The proposed action will affect salmonid species considered in this opinion by causing physical, chemical, and biological changes to the environment. These effects include a temporary reduction in water quality from the use of herbicides (increased suspended sediment, increase in chemical contamination, and decrease in dissolved oxygen), and harassment/displacement from removal of vegetation below OHW.

Currently, the BLM’s invasive plant management program is covered by ESA and EFH consultation provided through the ARBO II (NMFS 2013a). The BLM will continue to use many project elements of ARBO II, and we are incorporating these effects by reference. Because the

BLM proposes to use additional methods, and chemicals that were not covered in ARBO II (NMFS 2013a), the analysis in this opinion will focus on the treatment methods not analyzed in ARBO II: Mechanical and manual, and application of herbicides of aquatic invasive plant treatment with 2,4-D amine, fluridone, glyphosate, imazapyr, and triclopyr BEE and TEA; and the terrestrial herbicide applications with fluroxypyr, fluazifop-P-butyl, hexazione, and rimsulfuron.

The BLM proposes to treat 1,500 acres per year with herbicides, and 4,500 acres per year manually. Given that large portions of the proposed action overlap with the proposed action in ARBO II (NMFS 2013a), although on a smaller scale, the effects analysis in the ARBO II opinion is directly relevant to the effects from the proposed action and thus we are incorporating by reference the effects of ARBO II (NMFS 2013a) into this opinion. Since the ARBO II (2013a), we are not aware of any new information about the effects of these chemicals on ESA-listed species and their habitat. The PDCs outlined in ARBO II (NMFS 2013a) are still considered the best ways to minimize the amount and likelihood that these chemicals would enter the stream where ESA-listed fish are present. In the ARBO II analyses, we concluded there would be a temporary reduction in water quality from increased chemical contamination and suspended sediment, decreased dissolved oxygen, as well as harassment/displacement of fish. In summary, this is because the PDCs included in that proposed action, including limitations on the herbicides, adjuvants, carriers, handling procedures, application methods, drift minimization measures, and riparian buffers, greatly reduce the likelihood that significant amounts of herbicide will be transported to aquatic habitats, although some herbicides are still likely to enter streams through aerial drift, in association with eroded sediment in runoff, and dissolved in runoff, including runoff from intermittent streams and ditches.

As explained in more detail in ARBO II, each type of proposed treatment is likely to affect fish and aquatic macrophytes through a combination of pathways, including disturbance, chemical toxicity, dissolve oxygen and nutrients, water temperature, sediment, instream habitat structure, forage, and riparian and emergent vegetation (Table 11).

Table 11. Potential pathways of effects of invasive and non-native plant control (from ARBO II, NMFS 2013a).

	Pathways of Effects							
Treatment Methods	**Disturbance***	**Chemical toxicity**	**Dissolved oxygen and nutrients**	**Water temperature**	**Fine sediment and turbidity**	**Instream habitat structure**	**Forage**	**Riparian and emergent vegetation**
Manual	X					X	X	X
Mechanical	X			X	X		X	X
Biological				X	X			
Herbicides		X	X	X	X	X	X	X

*****Stepping on redds, displacing fish, interrupting fish feeding, or disturbing banks.

2.5.1 Effects on Listed Species

Because the BLM is now proposing applications of five herbicides for over-water use (2,4-D amine, fluridone, glyphosate, imazapyr, and triclopyr BEE and TEA), and the use of new four terrestrial herbicides (fluroxypyr, fluazifop-P-butyl, hexazione, and rimsulfuron) that are not covered in ARBO II (NMFS 2013a), our effects analysis will focus on these herbicides and uses. Our analysis of the remaining chemicals addressed in ARBO II (NMFS 2013a) is incorporated here by reference. That analysis is considered current and valid because the PDCs outlined in ARBO II (NMFS 2013a) are still considered the best practices to reduce the amount, and minimize the likelihood that these chemicals would enter streams where ESA-listed fish are present.

Aquatic Herbicide Treatment

Two factors determine the risk to aquatic organisms (early life stages i.e., egg-to-fry) from use of herbicides: the toxicity of the chemical to individual organisms, and the likelihood organisms would be exposed to the chemical. Because some aquatic herbicides would be applied to vegetation where plants are in the water column, Risk Assessments (RAs) focusing on the toxicity to organisms from direct exposure, including an accidental spill, are the appropriate scenarios for evaluating risk to aquatic flora and fauna from use of aquatic herbicides. The BLM used the U.S. Forest RAs for effects to aquatic organisms (SERA 225, 2009, 2011, and 2014).

Our assessment of risk of effects on fish and other aquatic organisms from herbicides is based on the RA information (summarized below in Table 12). Fish species analyzed in the RA include Chinook salmon, coho salmon, chum salmon, sockeye salmon, pink salmon, rainbow trout, fathead minnows, and bluegills.

Table 12. Forest Service-Evaluated Herbicide Risk Categories for Aquatic Organisms (Aquatic Formulations)(SERA 2008, SERA 2011a, SERA 2011b, 2011c)

Receptor		2,4-D Amine		Fluridone		Glyphosate		Imazapyr		Triclopyr	
		Typ[1]	Max[1]	Typ	Max	Typ	Max	Typ	Max	Typ	Max
Flora											
Accidental Acute Exposures											
Macrophyte	Susceptible	H	H	H	H	H	H	H	H	H	H
Macrophyte	Tolerant	0	L	H	H	0	0	M	H	L	M
Algae	Susceptible	L	L	H	H	H	H	L	L	M	H
Algae	Tolerant	0	0	H	H	0	L	0	0	L	M
Non-Accidental Acute Exposures											
Macrophyte	Susceptible	M	M	M	M	L	M	M	M	H	H
Macrophyte	Tolerant	0	0	0	L	0	0	0	L	0	0
Algae	Susceptible	0	0	0	L	L	L	0	0	0	L
Algae	Tolerant	0	0	0	0	0	0	0	0	0	0
Chronic / Longer term Exposures											
Macrophyte	Susceptible	M	M	L	M	L	L	M	M	M	H
Macrophyte	Tolerant	0	0	0	L	0	0	0	L	0	0
Algae	Susceptible	0	0	0	L	0	L	0	0	0	0
Algae	Tolerant	0	0	0	0	0	0	0	0	0	0
Fauna											
Accidental Acute Exposures											
Fish	Susceptible	0	0	H	H	M	H	0	L	0	L
Fish	Tolerant	0	0	M	M	L	L	NE	NE	0	0
Amphibian	Susceptible	0	0	NE	NE	0	0	NE	NE	0	L
Amphibian	Tolerant	0	0	NE	NE	0	0	NE	NE	0	L
Invertebrate	Susceptible	0	0	H	H	M	M	NE	NE	0	L
Invertebrate	Tolerant	0	0	M	M	0	0	0	0	0	0
Non-Accidental Acute Exposures											
Fish	Susceptible	0	0	0	0	0	L	0	0	0	0
Fish	Tolerant	0	0	0	0	0	0	NE	NE	0	0
Amphibian	Susceptible	0	0	NE	NE	0	0	NE	NE	0	0
Amphibian	Tolerant	0	0	NE	NE	0	0	NE	NE	0	0
Invertebrate	Susceptible	0	0	0	0	0	0	NE	NE	0	0
Invertebrate	Tolerant	0	0	0	0	0	0	0	0	0	0
Chronic / Longer Term Exposures											
Fish	Susceptible	0	0	0	L	0	L	0	0	0	0
Fish	Tolerant	0	0	0	0	0	0	0	0	0	0
Amphibian	Susceptible	NE	NE	NE	NE	0	0	NE	NE	NE	NE
Amphibian	Tolerant	NE	NE	NE	NE	0	0	NE	NE	NE	NE
Invertebrate	Susceptible	0	0	0	0	0	0	NE	NE	0	0
Invertebrate	Tolerant	0	0	0	0	0	0	0	0	0	0

1. Typ = Typical application rate; and Max = Maximum application rate (see Table B-2, *Herbicide Information*, for typical and max applications rates. Application rates by species group can be found in the *Treatment Key* in Appendix C)

Risk categories: 0 = No risk (majority of Hazard Quotients < 1); L = Low risk (majority of Hazard Quotients >1 but < 10); M = Moderate risk (majority of Hazard Quotients > 10 but < 100); H = High risk (majority of Hazard Quotients > 100); and NE = Not evaluated. Risk categories are based on upper Hazard Quotient estimates. To determine risk for lower or central Hazard Quotient estimates, see the individual herbicide Risk Assessments. Risk categories are based on comparison to the Hazard Quotient of 1 for typical and maximum application rates.

2, 4-D amine. The RA for aquatic formulations of 2,4-D amine shows a hazard quotient (HQ) of less than 0.5 (essentially no risk) under all scenarios analyzed with direct spray to fish and other aquatic fauna. Therefore, there is no potential that use of this herbicide would impart direct or indirect effects to these aquatic species.

Glyphosate. The RA for aquatic glyphosate shows a HQ of less than one for typical non-accidental applications for susceptible fish and aquatic macroinvertebrates. However, under the accidental acute exposure scenario (e.g., a spill), the risk is elevated to 73 (moderate) at typical application rates, and 257 (high) at maximum application rates to fish and is within the moderate range for aquatic macroinvertebrates. However, the proposed application rates are less than 1.5 percent of the maximum rate and only 5 percent of the typical rate analyzed by the RA (BLM 2018). At these low concentrations, there would be no risk to aquatic fauna from glyphosate, unless a spill of concentrated chemical occurred directly in water, which would result in localized impacts to aquatic organisms. SOPs such as mixing and loading in areas where spill would not contaminate waterbodies would eliminate or reduce to a very low level the risk of such a spill. Given the small area to be treated in any given year, and lack of direct risk to fish and other aquatic organisms, and the very low risk of a spill, any potential future use of glyphosate as proposed is not expected to affect fish or aquatic insects.

Triclopyr. The RA for the aquatic formulation of triclopyr shows no risk to any aquatic organisms under all scenarios, except for the accidental acute exposure scenario calculated for maximum rates of application (10 lbs. / acre; see Table B-2 in the EA). SOPs such as mixing and loading in areas where spill would not contaminate waterbodies would eliminate or reduce to a very low level the risk of such a spill such that we do not expect effects from triclopyr spills. As shown in Appendix C of the EA (BLM 2018), proposed application rates of triclopyr in aquatic systems range from 0.6 to 2 lbs. / acre; therefore, there would be no risk to any aquatic fauna from use of this herbicide as proposed.

Imazapyr. For imazapyr, there is a similar risk to fish as described for triclopyr BEE: no risk under any scenarios except for a low risk at the maximum rate under acute accidental exposure. SOPs such as mixing and loading in areas where spill would not contaminate waterbodies would eliminate or reduce to a very low level the risk of such a spill such that we do not expect effects from imazapyr spills. Given the small area to be treated in any given year, and lack of direct risk to fish and other aquatic organisms, and the very low risk of a spill, any potential future use of glyphosate as proposed is not expected to affect fish or aquatic insects.

Fluridone. The RA for fluridone showed no risk to macroinvertebrates, a low risk to susceptible fish under chronic long-term exposure, and a high risk at typical rates of application from acute accidental exposure to both fish and insects (BLM 2018). SOPs such as conducting mixing and loading operations in areas where an accidental spill would not contaminate an aquatic body, would further reduce risk of exposure such that we do not expect effects from fluridone spills. Application rates proposed for fluridone use under the proposed action are very low (5 to 30 parts per billion in water) and fluridone would only be used in closed aquatic habitats that are disconnected and do not flow into streams and only on an extremely limited basis (less than 1 percent of all anticipated future treatments). Because treatments using fluridone would be limited, if ever used at all, concentrations would be so low, and would not be applied to any habitat occupied by ESA-listed fish, there is a very low potential that use of it would result in any effects to ESA-listed fish.

Suspended Sediment and Harassment/Displacement. The BLM proposes to hand paint herbicides on some vegetation that is in the water column. This will likely cause a short-term increase of suspended sediment from disturbing the substrate while walking in the water. This disturbance would also cause harassment and displacement of any fish in the area of treatment. These effects will be minor and short-term (hours), and spatially and temporally separated.

<u>Summary of Aquatic Herbicide Effects</u>. There are 8,225 miles of water quality limited streams and lakes within the action area, some of which are impaired due to the presence of aquatic invasive plants. Under the proposed action, aquatic formulations of 2,4-D, glyphosate, imazapyr, triclopyr BEE, and fluridone would be available to treat submerged and floating aquatic invasive plants and emergent aquatic invasive plant infestations. Although these herbicides could be applied across the NOD, at present, the only aquatic infestations known to occur include areas that total less than one acre: Three sites at the Hult Pond (parrot feather) and one site along Kelly Creek (yellow flag iris). These aquatic treatments are a high priority for the NOD to prevent them from spreading further. Our analysis is focused on, but not limited to these areas.

In the short term, there would be minimal effects from herbicide treatments on ESA-listed fish. This is because the herbicides that can be used in salmon-bearing waters pose a low toxicity risk to fish and macroinvertebrates, and the herbicides that have high toxicity would be restricted by PDFs that minimize the likelihood of herbicides reaching streams that contain ESA-listed fish.

In the short term, there would be a minor effect from suspended sediment, and harassment/displacement of fish from the treatment of vegetation in the water column.

Over the long term, there would be a benefit to streams and ESA-listed fish populations by application of herbicide treatments to control invasive plant populations and restore native vegetation assemblages. This is because invasive plants typically provide low value to riparian and aquatic ecosystem. Invasive plants tend to form monocultures, reduce diversity of native, plants, and generally disrupt aquatic habitat forming processes.

Terrestrial Herbicide Treatment

Terrestrial application of herbicides can reach aquatic habitat and potentially expose fish during (1) Runoff from riparian application; (2) application within perennial stream channels; and (3) runoff from intermittent stream channels and ditches (NMFS 2013a). Stream margins often provide shallow, low-flow conditions, have a slow mixing rate with mainstem waters, and are the site at which subsurface runoff is introduced. Juvenile salmon and steelhead, particularly recently emerged fry, often use low-flow areas along stream margins. For example, wild Chinook salmon rear near stream margins until they reach about 60 mm in length. As juveniles grow, they migrate away from stream margins and occupy habitats with progressively higher flow velocities. Nonetheless, stream margins continue to be used by larger salmon and steelhead for a variety of reasons, including nocturnal resting, summer and winter thermal refuge, predator avoidance, and flow refuge.

Spray and vapor drift are important pathways for herbicide entry into aquatic habitats. Several factors influence herbicide drift, including spray droplet size, wind and air stability, humidity and temperature, physical properties of herbicides and their formulations, and method of application. For example, the amount of herbicide lost from the target area and the distance the herbicide moves both increase as wind velocity increases. Under inversion conditions, when cool air is near the surface under a layer of warm air, little vertical mixing of air occurs. Spray drift is most severe under these conditions, since small spray droplets will fall slowly and move to adjoining areas even with very little wind. Low relative humidity and high temperature cause more rapid evaporation of spray droplets between sprayer and target. This reduces droplet size, resulting in increased potential for spray drift. Vapor drift can occur when herbicide volatilizes. The formulation and volatility of the compound will determine its vapor drift potential. The potential for vapor drift is greatest under high air temperatures and low humidity and with ester formulations. For example, ester formulations of triclopyr BEE are very susceptible to vapor drift, particularly at temperatures above 80°F. When temperatures go above 75˚F, 2,4-D ester chemicals evaporate and drift as vapor. Even a few days after spraying, ester-based phenotype herbicides still release vapor from the leaf surface of the sprayed weed (DiTomaso et al. 2006). Herbicides and pesticides are detected frequently in freshwater habitats within the four western states where listed Pacific salmonids are distributed (NMFS 2011d).

When herbicides are applied with a sprayer, nozzle height controls the distance a droplet must fall before reaching the weeds or soil. Less distance means less travel time and less drift. Wind velocity is often greater as height above ground increases, so droplets from nozzles close to the ground would be exposed to lower wind speed. The higher that an application is made above the ground, the more likely it is to be above an inversion layer that will not allow herbicides to mix with lower air layers and will increase long distance drift. Several proposed PDC address these concerns by ensuring that herbicide treatments will be made using ground equipment or by hand, under calm conditions, preferably when humidity is high and temperatures are relatively low. Ground equipment reduces the risk of drift, and hand equipment nearly eliminates it.

Fluroxypyr. The RA for fluroxypyr shows that it is practically nontoxic to freshwater invertebrates at the typical application rate, and a low risk to fish at the maximum rate (AECOM 2014) based on the acute exposure (Jones and Willis 1984). The Environmental Protection Agency (EPA) did not require a chronic study in aquatic invertebrates because of the low toxicity of fluroxypyr to this group of organisms (U.S. EPA/OPP 1998). Fluroxypyr is slightly toxic to practically nontoxic to fish, based on acute toxicity. Because of the low toxicity of fluroxypyr to fish, the EPA did not require an early life-stage or a fish life-cycle toxicity study (SERA 2009). SOPs such as mixing and loading in areas where spill would not contaminate waterbodies would eliminate or reduce to a very low level the risk of such a spill such that we do not expect effects from fluroxypr spills. Given that fluroxypyr has a low toxicity to fish, and the very low risk of a spill, any potential future use of fluroxypyr, as proposed is not expected to affect fish or aquatic insects.

Fluazifop-P-Butyl. The HQs for fish are below the level of concern (HQ=1), except for the accidental exposure scenarios (SERA 2014). The upper bounds of the HQs for the accidental spill scenarios are 25 for sensitive species of fish and 9 for tolerant species of fish. As detailed in the RA (SERA 2014), the upper bound HQs are based on a water concentration of about 5.8 mg a.e./L fluazifop-P-butyl and formulations of fluazifop-P-butyl. As summarized in Table 27 of the RA (SERA 2014), the acute LC_{50} values for technical grade fluazifop-P-butyl and formulations of fluazifop-P-butyl range from about 0.25 mg a.e./L to 4.2 mg a.e./L (Tejada et al. 1994). In the event of a serious accidental spill similar to that developed in the RA, fish mortality would probably be observed. European studies indicate that fluazifop-P-butyl is very toxic to aquatic organisms (EFSA 2012)[8]. SOPs such as conducting mixing and loading operations in areas where an accidental spill would not contaminate an aquatic body, would further reduce risk of exposure such that we do not expect effects from fluazifop-P-Butyl spills.

For the non-accidental exposures, none of the HQs exceed the level of concern. The highest HQ is 0.7 (*i.e.*, the upper bound of the acute HQ) for sensitive species of fish following three applications of fluazifop-P-butyl. There is no basis for asserting that fish will be adversely impacts due to exposures to fluazifop-P-butyl anticipated in the normal use of this herbicide.

As with the HQs for fish, the HQs for aquatic invertebrates are above the level of concern for the accidental spill scenarios. The upper bound HQs are 121 for sensitive species and 5 for tolerant species. As with the fish scenarios, these upper bound HQs are based on a water concentration of 5.8 mg a.e./L fluazifop-P-butyl. As summarized in Table 28 of the RA (SERA 2014), the formulations of fluazifop-P-butyl are much more toxic than technical grade fluazifop-P-butyl to *Daphnia magna*, and the dose-response assessment does not consider the relatively high LC_{50} values for technical grade in fluazifop-P-butyl in *Daphnia magna*. For even presumably tolerant species of aquatic invertebrates, detectable mortality could be seen following an accidental spill.

For acute exposures, the upper bound HQs exceed the level of concern for sensitive species of aquatic invertebrates (HQs of 1.5 to 3). For longer term exposures, the upper bound HQs also exceed the level of concern for sensitive species of aquatic invertebrates (HQs of 1.8 to 4). Consequently, adverse effects on aquatic macrophyte production may cause a reduction in availability of forage for juvenile salmonids. Over time, juvenile salmonids that receive less food have lower body condition and smaller size at smoltification. The BLM proposes to treat a maximum of 15 acres per field office annually. In addition, PDCs, including limitations on the herbicides, adjuvants, carriers, handling procedures, application methods, drift minimization measures, and riparian buffers, will greatly reduce the likelihood that significant amounts of herbicide will be transported to aquatic habitats. However, the small amount of fluazifop-P-butyl expected to reach the water should not result in effects this severe. SOPs such as mixing and loading in areas where spill would not contaminate waterbodies would eliminate or reduce to a very low level the risk of such a spill.

Hexazinone. The risk characterization for fish is based on a set of standard toxicity studies. Under foreseeable (non-accidental) conditions, there is no indication that hexazinone will cause direct toxic effects in fish even at the highest anticipated application rate of 4 lbs/acre. At this rate, the highest HQ for peak exposure is 0.01 and the highest HQ for longer-term exposure is 0.02. Under standard exposure scenarios involving the accidental spill of hexazinone into a small body of water, the highest HQ is 0.5 (SERA 2005).

As with other groups that do not appear to be directly at risk from the toxic effects of hexazinone, secondary effects on fish could be associated with damage to aquatic vegetation.

[8] The lowest endpoint driving the aquatic risk assessment was observed in a study with the formulation on algae (EbC50=0.024 mg a.s./L)

The nature of these effects could be beneficial or detrimental and could be variable over time and probably among different species of fish (SERA 2005).

The risk characterization for aquatic invertebrates is virtually identical to that for fish. Based on a conservative analysis of a set of standard toxicity studies, there is little basis for asserting that direct toxic effects on aquatic invertebrates are plausible. None of the HQs for non-accidental exposures exceed a level of concern based on either peak or longer-term concentrations of hexazinone in water at the maximum application rate of 4 lbs/acre. In the event of an accidental spill at the maximum application rate, the maximum HQ is above the level of concern by a factor of four. In this instance, direct toxic effects could occur (SERA 2005). However, SOPs such as mixing and loading in areas where spill would not contaminate waterbodies would eliminate or reduce to a very low level the risk of such a spill such that we do not expect effects from. hexazinone spills. Given that hexazinone will be applied in the upland, PDCs such as weather restrictions, application methods, drift minimization measures, and riparian buffers, any potential future use of hexazinone, as proposed is not expected to affect fish or aquatic insects.

Rimsulfuron. Rimsulfuron is practically nontoxic to fish, and has little toxic impact on fish and aquatic invertebrates (USDI BLM 2014). One study examined the acute toxic effects of rimsulfuron on rainbow trout (*Oncorhynchus mykiss*), a coldwater species. This study found that no adverse effects occurred after 96 hours of exposure to 390 mg/liter. The LC50 from this study was determined to be in excess of 390 mg/L (USDI BLM 2014).

Freshwater invertebrate toxicity tests are required for the EPA pesticide registration process. Two core acute toxicity tests using water fleas (*Daphnia magna)* were reviewed. In these acute studies, the statistical endpoint (the EC50) is the concentration that causes an effect in 50% of the test organisms after 48 hours. The lowest EC50 reported from these studies was >50 mg/L using a 99.5% rimsulfuron product (Martins et al. 2001). The second test reported an EC50 value of >360 mg/L using a 98.8% rimsulfuron product (USDI BLM 2014). SOPs such as mixing and loading in areas where spill would not contaminate waterbodies would eliminate or reduce to a very low level the risk of such a spill such that we do not expect effects from rimsulforon spills. Given that rimsulfuron will be applied in the upland, PDCs such as weather restrictions, application methods, drift minimization measures, and riparian buffers, any potential future use of rimsulfuron, as proposed is not expected to affect fish or aquatic insects. Given that rimsuluron has a low toxicity to fish, and the very low risk of a spill, any potential future use of rimsulfuron, as proposed is not expected to affect fish or aquatic insects.

Summary of Terrestrial Herbicide Effects. The proposed PDCs, including limitations on the herbicides, adjuvants, carriers, handling procedures, application methods, drift minimization measures, and riparian buffers, will greatly reduce the likelihood that significant amounts of herbicide will be transported to aquatic habitats, although some herbicides are still likely to enter streams through aerial drift, in association with eroded sediment in runoff, and dissolved in runoff, including runoff from intermittent streams and ditches.

Targeted Grazing. The non-herbicide direct control methods available under the proposed action would include manual (e.g., hand-pulling, digging, grubbing, solarization), mechanical (e.g., mowing, tilling or disking, string trimmers, propane torch), seeding and planting, prescribed fire, and biological control agents (generally insects). These activities were analyzed under ARBO II (NMFS 2013a). The BLM proposes to follow all PDCs in ARBO II (NMFS 2013a) for these activities. Our analysis in ARBO II (NMFS 2013a) is incorporated by reference.

The BLM is proposing a new method of mechanical treatment that is not covered in ARBO II (NMFS 2013a): Targeted grazing by goats and sheep. Our effects analysis will focus on this new mechanical method of treatment.

Targeted grazing by goats or sheep would not reduce streamside shade because vegetation providing primary streamside shade would be maintained during treatment. The PDFs listed in Appendix D of the EA (BLM 2018) ensure that streamside vegetation would be maintained during treatment. The Water Resources, Wetlands and Riparian Areas, and Vegetation PDFs state that the BLM will require the retention of stream-side vegetation that provides shade. Treatments would be designed and implemented so that no over-story trees would be affected by these treatments and shade providing canopy would be maintained. Goats would also be limited by height to grazing understory shrub layer four to five feet in height and would not affect shade providing overstory conifer and riparian hardwoods.

Targeted grazing by goats or sheep can affect streambank stability, and result in a subsequent increase in suspended sediment from animals in the riparian area, and streams. The BLM proposes the application of PDFs and SOPs that require a vegetated strip 50 feet from the top of the stream bank be left adjacent to stream banks. Any short-term ground disturbance outside of that protective strip would not affect stream-bank stability. Concentrated overland flow generally results in sediment contribution when distances are less than 35 feet (Rashin et al. 2006). Undisturbed ground resulting from a 50-foot buffer would be adequate to slow and filter any sediment resulting from compacted areas. The retention of that vegetated buffer would also serve to protect from sediment contribution by capturing any overland delivery from disturbed areas. If grazing by goats or sheep is used to control an invasive population, a full-time herder or fencing is required to keep the grazing focused on the target areas and species, and away from water sources. Although these PDFs and SOPs would minimize the likelihood of animals entering the riparian area, and stream, there is a possibility that some animals could stray, and cause a short-term, minor effect of increased suspended sediment.

2.5.2 Effects on Critical Habitat

Designated critical habitat within the action area for ESA-listed salmon and steelhead considered in this opinion consists of freshwater spawning sites, freshwater rearing sites, and freshwater migration corridors, and their essential physical and biological features (PBFs) as listed below. The PBFs are identical for LCR Chinook salmon, LCR coho salmon, LCR steelhead, OC coho salmon, UWR Chinook salmon, and UWR steelhead. The effects of the proposed action on these features are summarized as a subset of the habitat-related effects of the action that were discussed more fully above. The adverse water quality, and forage effects described will be short-term (hours to days) during and immediately following mechanical, manual, and chemical invasive plant removal.

Freshwater spawning

Substrate – Substrate embeddedness downstream of sediment generating activities described in the previous section is likely to result in temporary decreases in available spawning areas because embedded substrate makes it more difficult for fish to dig redds, clogs interstitial spaces, reduces intergravel velocities, and reduces dissolved oxygen concentrations in redds.

Water quality – Water quality will be temporarily and locally degraded by increases in suspended sediment from manual and mechanical invasive plant removal, an increase in chemical contamination, and a temporary decrease in dissolved oxygen from the use of herbicides.

Water quantity –No effect.

Freshwater rearing

Floodplain connectivity – No effect.

Forage – Decreased quantity and quality of forage due to increases in suspended sediment during manual and mechanical invasive plant removal, and a decrease in vegetation, and forage from the use of herbicides.

Natural cover – No effect.

Water quality – Water quality will be temporarily and locally degraded by increases in suspended sediment from manual and mechanical invasive plant removal, an increase in chemical contamination, and a temporary decrease in dissolved oxygen from the use of herbicides.

Water quantity – No effect.

Freshwater migration

Free of artificial obstruction – No effect

Natural cover – No effect.

Water quality – Water quality will be temporarily and locally degraded by increases in suspended sediment from manual and mechanical invasive plant removal, an increase in chemical contamination, and a temporary decrease in dissolved oxygen from the use of herbicides.

Water quantity – No effect.

The proposed action is likely to cause minor, localized and temporary degradation of critical habitat PBFs for substrate, water quality, and forage. None of the effects are likely to reduce the quality and function of the PBFs within the action area over the long term. The critical habitat in the action area will retain its ability to provide freshwater spawning sites, rearing sites and migration corridors for the species considered in this opinion.

2.5 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

The contribution of non-Federal activities to the current condition of ESA-listed species and designated critical habitats within the action area was described in the Status of the Species and Environmental Baseline sections, and are expected to continue into the future. Some adjacent lands are in private timber production. Private forest management can produce adverse effects to listed fish, including increased suspended sediment, increased stream temperature, reduced woody inputs, and increased road density. Chemical fertilizers or pesticides likely are used on these lands, but no specific information is available regarding their use. On some streams that are on non-Federal lands, forestry operations conducted in compliance with the Oregon Forest Practices Act are likely to reduce stream shade, slow the recruitment of large woody debris, and add fine sediments. Since cumulative watershed effects are not limited by the Act, road density on private forest lands, which is high throughout the range of ESA-listed species considered in this opinion, is likely to increase or stay the same (71 FR 834).

Historically, resource-based industries caused many long-lasting environmental changes that harmed ESA-listed species and their critical habitats, such as state-wide loss or degradation of stream channel morphology, spawning substrates, instream roughness and cover, estuarine rearing habitats, wetlands, floodplains, riparian areas, water quality (*e.g.*, temperature, sediment, dissolved oxygen, contaminants), fish passage, and habitat refugia. The economic and environmental significance of Oregon's natural resource-based economy is declining in absolute terms and relative to a newer economy based on mixed manufacturing and marketing with an emphasis on high technology (Brown 2011). Nonetheless, resource-based industries are likely to continue to have an influence on environmental conditions within the action area for the indefinite future. The activity level of some industries, such as forest products, may increase in intensity as the nation's economy improves and export opportunities increase, raising the value of extracted materials.

While natural resource extraction within Oregon may be declining, general resource demands (*e.g.*, demands due to urban and suburban development, recreational activities, road construction and maintenance, shipping, and water withdrawals) are increasing with growth in the size and standard of living of the local and regional human populations. As of 2010, Oregon has a population of approximately 3.8 million residents. During the most recent 50-year period (1960-2010), decadal growth averaged 16.9%, with a range of 7.9% (1980s) to 25.9% (1970s). During the latest census period (2000-2010), the population of Oregon grew 12% (Mackun et al. 2011, PSU 2012).

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminishes the value of designated or proposed critical habitat for the conservation of the species.

The six species considered in this consultation are listed as threatened. Their current status results from low abundance, low productivity, reduced spatial structure, and reduced genetic diversity. These viability characteristics are driven in part by systemic habitat loss or degradation, where physical and biological features of critical habitat are insufficient to support abundance characteristic of a viable population.

The environmental baseline in the action area is such that individual ESA-listed salmonids in the action area are exposed to simplified in-stream channel morphology; reduced instream roughness and cover; loss and degradation of off-channel areas, refugia, estuarine rearing habitats, riparian areas, spawning areas, and wetlands; degradation of water quality (*e.g.*, temperature, sediment, dissolved oxygen, contaminants); and blocked fish passage. Individuals of ESA-listed salmon, and steelhead, use the action area for rearing, migration, and spawning. The viability of the various populations that comprise the six salmon and steelhead species considered in this opinion ranges from extirpated or nearly so to populations that are a low risk for extinction.

Habitat improvement projects are being actively implemented through salmon recovery efforts, the restoration projects and other conservation measures built into other actions, and a combination of Federal, tribal, state and local actions. At the same time, population growth and development pressures on aquatic systems are increasing, particularly in the Willamette Valley.

Limiting factors for populations affected by the proposed actions included degraded floodplain connectivity and function, degraded channel structure and complexity, degraded riparian areas and large wood recruitment, degraded stream substrate, degraded water quality from altered water temperature, and degraded stream flows. Although ESA-listed salmonids are affected by these limiting factors, Federal lands managed under the NWFP have shown an overall improvement in aquatic ecosystems over the past 20 years (Reeves et al. 2016). These improvements include a diversity and complexity of watershed features; spatial and temporal connectivity within and between watersheds; physical integrity; water quality; sediment input storage, and transport; instream flows (e.g., both peak and low flows); floodplain inundation; riparian plant species composition and structural diversity; and habitat to support well-distributed populations of native plant, invertebrate, and vertebrate aquatic-and riparian-dependent species (Reeves et al. 2016).

Effects from the proposed action will affect salmon species considered in this opinion by causing physical, chemical, and biological changes to the environment. These effects include a temporary reduction in water quality from the use of herbicides (increased suspended sediment, increase in chemical contamination, and decrease in dissolved oxygen); and increased suspended sediment, redd trampling, and harassment/displacement from removal of vegetation below OHW.

The proposed action is likely to cause a slight decrease in the rate of egg and fry survival, and injury in juveniles and adults as a result of increased suspended sediment, increased chemical contamination, and decreased dissolved oxygen. However, these effects are not expected to cause a biologically meaningful effect at the population scale. This is due to narrow limits on amount of annual invasive species removal projects which will separate the effects in space and time in the action area, and the relatively short duration of the minor, anticipated effects. The BLM owns 714,395 acres in the NOD. The BLM proposes to treat 1,500 acres per year with herbicides, and 4,500 acres per year manually. This is approximately 0.2 percent, and 0.6 percent, respectively of all BLM lands. In addition, the effects will be minor and short-term, and spatially and temporally separated. Because of this, there will likely be only a very small number of fish affected at any one time, (a very small reduction in abundance) and thus there will be little or no effect on the other viability parameters (productivity, spatial structure, diversity) of LCR Chinook salmon, UWR Chinook salmon, LCR coho salmon, OC coho salmon, LCR steelhead, and UWR steelhead. As previously stated, this new Integrated Invasive Plant Management will replace the use of ARBO II (NMFS 2013a) for the treatment of invasive vegetation treatment in the NOD BLM. Based on this program's protective suite of PDFs, PDCs, and SOPs, and the inclusion of the PDCs incorporated from ARBO II (NMFS 2013a), we expect the aggregate and synergistic effect of activities occurring under the program will maintain and potentially improve the viability of populations of listed species on the NOD. Therefore, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of ESA-listed salmonids, even when combined with a degraded environmental baseline, cumulative effects, and climate change.

Many streams in the action area are designated as critical habitat for ESA-listed salmon and steelhead. CHART teams determined that most designated critical habitat for ESA-listed salmon and steelhead has a high conservation value, based largely on its restoration potential. Baseline conditions for these PCEs vary widely, from poor to excellent. The value of critical habitat in some areas is limited by altered hydrology, blocked fish passage, and a lack of complex habitat to provide forage, cover, and spawning habitat.

Adverse effects to the quality and function of critical habitat PBFs influenced by this action will be minor to moderate intensity due to the small to moderate magnitude of suspended and depositional sediment, and decrease in water quality likely to occur. As stated above, the effects will be minor and short-term, and spatially and temporally separated. Because of this, the effects of the proposed action will not preclude or significantly delay development of the critical habitat features and its ability to conserve ESA-listed fish covered in this opinion.

2.7 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of LCR Chinook salmon, UWR Chinook salmon, LCR coho salmon, Oregon Coast coho salmon, LCR steelhead, UWR steelhead, or destroy or adversely modify their designated critical habitat.

2.8 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.8.1 Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

- Harm to juveniles and adults of all ESA-listed salmon and steelhead considered in this opinion due to herbicide application that causes reduced water quality, decreased dissolved oxygen.
- Harm or harassment to eggs, fry, juveniles and adults of all ESA-listed salmon and steelhead considered in this opinion due to redd trampling, a temporary increase in suspended sediment during manual and mechanical invasive plant removal (reduced water quality).

The distribution and abundance of fish that occur within an action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by the proposed action. Thus, the distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action. In such circumstances, NMFS cannot provide an amount of take that would be caused by the proposed action. In such circumstances, NMFS uses an "extent of take" that can be monitored, and that is causally related to the take.

The best available indicators for the extent of take are:

1. For harm associated with herbicide application, the best available indicator is the number of acres treated per year. This feature best integrates the likely take pathway associated with this action, is proportional to the anticipated amount of take, and is the most practical and feasible indicator to measure. There is a causal link between the surrogate and the take pathway because the number of acres of herbicides that are used each year are proportional to the amount of herbicides that may enter streams, and thus cause incidental take of fish. Therefore, the extent of take indicator that will be used as a reinitiation trigger for this consultation is herbicide application on a maximum of 1,500 acres per year.

2. For harm associated with an increase in suspended sediments, the best available indicator is the number of acres manually, and mechanically treated per year. This feature best integrates the likely take pathway associated with this action, is proportional to the anticipated amount of take, and is the most practical and feasible indicator to measure. There is a causal link between the surrogate and the take pathway because the number of acres that are treated manually each year are proportional to the amount of disturbance, and the amount of sediment that may enter streams, and thus cause incidental take of fish. Therefore, the extent of take indicator that will be used as a reinitiation trigger for this consultation is manual and mechanical invasive plant treatment on a maximum of 4,500 acres per year.

2.8.2 Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

The BLM shall:

1. Minimize incidental take due to authorizing or conducting projects by ensuring that all such projects use the conservation measures described in the proposed action and analyzed in this opinion, as appropriate.
2. Complete notification, monitoring and reporting to confirm that the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are effective in minimizing incidental take.

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the BLM must comply with them in order to implement the RPMs (50 CFR 402.14). The BLM has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1 [PDCs, from ARBO II (NMFS 13a)]:
    a. Administer every action funded or carried out under this opinion in a manner consistent with PDC 1 through 4.
    b. For each action with a general construction element, apply PDC 10 through 20.
    c. For treatments of aquatic invasive plants, apply the following SOPs:
        i. Fluridone will only occur in closed aquatic habitats that do not flow into streams during the treatment window. These are typically ponds and lakes, or sloughs and pools of standing water on floodplains connected to rivers only during high water events.
        ii. Aquatic invasive plants in streams and rivers would only be treated with 2,4-D amine , glyphosate, imazapyr, and triclopyr BEE in areas where a portion of the plant is sticking out of the water or when water levels are at their lowest and the invasive plants that were previously submerged or floating are no longer in water.
    d. For non-native invasive plant control, apply PDC 33. If aquatic restoration activities have complementary actions, follow the associated PDC and conservation measures for each complementary action.

2. The following terms and conditions implement reasonable and prudent measure 2 (monitoring and reporting):
    a. The BLM will submit a monitoring report to NMFS by February 15 each year that describes the BLM's efforts to carry out this opinion. The report will include an assessment of overall program activity by watershed, and any other data or analyses the BLM deems necessary or helpful to assess habitat trends as a result of actions completed under this opinion.
    b. The BLM will attend an annual coordination meeting with NMFS by April 30 each year to discuss the annual monitoring report and any actions that will improve conservation under this opinion, or make the program more efficient or

more accountable.

c. The BLM will complete and record the following data invasive plant control programmatic activities that occur annually:
   i. The number of acres of herbicide application.
   ii. The number of acres of manual and mechanical invasive plant control.

2.9 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

NMFS offers the following conservation recommendation:

- Minimize the use of herbicides for non-native and invasive vegetation control by exploring alternative methods of vegetation control.

2.10 Reinitiation of Consultation

This concludes formal consultation for the Integrated Invasive Plant Management for the NOD, BLM.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR

600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the BLM and descriptions of EFH for Pacific Coast salmon (PFMC 2014) contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of Chinook and coho salmon as identified in the Fishery Management Plan for Pacific coast salmon (Pacific Fishery Management Council 2014).

3.2 Adverse Effects on Essential Fish Habitat

Based on information provided by the action agency and the analysis of effects presented in the ESA portion of this document, NMFS concludes that proposed action will have adverse effects on EFH designated for Chinook and coho salmon. These effects include a temporary reduction in water quality from increased suspended sediment and increase in contaminants from herbicide use.

3.3 Essential Fish Habitat Conservation Recommendations

1. Follow terms and conditions 1 and 2 (not including monitoring and reporting for fish capture and handling) as presented in the ESA portion of this document to minimize adverse effects to water quality and monitor program effects.
2. Implement the conservation recommendations presented as part of the ESA portion of this document.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2, above, approximately 100 acres of designated EFH for Pacific Coast salmon.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the BLM must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS’ EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The BLM must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the BLM. Other interested users could include contractors. A copy of this opinion were provided to the BLM. The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation, contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

5. REFERENCES

Abatzoglou, J.T., Rupp, D.E. and Mote, P.W. 2014. Seasonal climate variability and change in the Pacific Northwest of the United States. Journal of Climate 27(5): 2125-2142.

AECOM. 2014. Fluroxypyr Ecological Risk Assessment Final Report. Prepared for USDI BLM. Manchester, New Hampshire.

ASI (American Sheep Industry). 2006. Targeted Grazing: A Natural Approach to Vegetation Management and Landscape Enhancement. Karen Launchbaugh (ed.). American Sheep Industry Assoc.

BLM (Bureau of Land Management). 2018. Integrated Invasive Plant Management for the Northwest Oregon District (DOI-BLM-ORWA-N000-2018-0002-EA) (Weeds EA). Northwest Oregon District.

Brown, R., S. Jeffries, D. Hatch, B. Wright, and S. Jonker. 2011. Field Report: 2011 Pinniped management activities at and below Bonneville Dam. Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, and Columbia River Inter-Tribal Fish Commission. Report. October 4. http://www.mediate.com/DSConsulting/docs/Bonneville%202011%20Field%20Report.pdf.

Crozier, L.G., Hendry, A.P., Lawson, P.W., Quinn, T.P., Mantua, N.J., Battin, J., Shaw, R.G. and Huey, R.B., 2008. Potential responses to climate change in organisms with complex life histories: evolution and plasticity in Pacific salmon. *Evolutionary Applications* 1(2): 252-270.

Crozier, L. G., M. D. Scheuerell, and E. W. Zabel. 2011. Using Time Series Analysis to Characterize Evolutionary and Plastic Responses to Environmental Change: A Case Study of a Shift Toward Earlier Migration Date in Sockeye Salmon. *The American Naturalist* 178 (6): 755-773.

Dominguez, F., E. Rivera, D. P. Lettenmaier, and C. L. Castro. 2012. Changes in Winter Precipitation Extremes for the Western United States under a Warmer Climate as Simulated by Regional Climate Models. *Geophysical Research Letters* 39(5).

Doney, S. C., M. Ruckelshaus, J. E. Duffy, J. P. Barry, F. Chan, C. A. English, H. M. Galindo, J. M. Grebmeier, A. B. Hollowed, N. Knowlton, J. Polovina, N. N. Rabalais, W. J. Sydeman, and L. D. Talley. 2012. Climate Change Impacts on Marine Ecosystems. *Annual Review of Marine Science* 4: 11-37.

EFSA (European Food Safety Authority). 2011. Conclusion on Pesticide Peer Review. Conclusion on the peer review of the pesticide risk assessment of the active substance floroxypyr (evaluated variant floroxypyr-meptyl). EFSA Journal 2011;9(3):2091

EFSA (European Food Safety Authority). 2012. Conclusion on Pesticide Peer Review. Conclusion on the peer review of the pesticide risk assessment of the active substance fluazifop-P (evaluated variant fluzifop-P-butyl). ESFA Journal 2012;10(11); 2945

Feely, R.A., T. Klinger, J.A. Newton, and M. Chadsey (editors). 2012. Scientific summary of ocean acidification in Washington state marine waters. NOAA Office of Oceanic and Atmospheric Research Special Report.

Glick, P., J. Clough, and B. Nunley. 2007. Sea-Level Rise and Coastal Habitats in the Pacific Northwest: An analysis for Puget Sound, southwestern Washington, and northwestern Oregon. National Wildlife Federation, Seattle, WA.

Goode, J.R., Buffington, J.M., Tonina, D., Isaak, D.J., Thurow, R.F., Wenger, S., Nagel, D., Luce, C., Tetzlaff, D. and Soulsby, C., 2013. Potential effects of climate change on streambed scour and risks to salmonid survival in snow-dominated mountain basins. *Hydrological Processes* 27(5): 750-765.

ISAB (editor). 2007. Climate change impacts on Columbia River Basin fish and wildlife. *In:* Climate Change Report, ISAB 2007-2. Independent Scientific Advisory Board, Northwest Power and Conservation Council. Portland, Oregon.

Intergovernmental Panel on Climate Change (IPCC). 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

Isaak, D.J., Wollrab, S., Horan, D. and Chandler, G., 2012. Climate change effects on stream and river temperatures across the northwest US from 1980–2009 and implications for salmonid fishes. *Climatic Change* 113(2): 499-524.

Kunkel, K. E., L. E. Stevens, S. E. Stevens, L. Sun, E. Janssen, D. Wuebbles, K. T. Redmond, and J. G. Dobson. 2013. Regional Climate Trends and Scenarios for the U.S. National Climate Assessment: Part 6. *Climate of the Northwest U.S. NOAA Technical Report NESDIS 142-6*. 83 pp. National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service, Washington, D.C.

Lawson, P.W., E.P. Bjorkstedt, M.W. Chilcote, C.W. Huntington, J.S. Mills, K.M. Moores, T.E. Nickelson, G.H. Reeves, H.A. Stout, T.C. Wainwright, and L.A. Weitkamp. 2007. Identification of historical populations of coho salmon (*Onchorynchus kisutch*) in the Oregon Coast evolutionarily significant unit. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NWFSC-79. 129 p.

Lawson, P. W., Logerwell, E. A., Mantua, N. J., Francis, R. C., & Agostini, V. N. 2004. Environmental factors influencing freshwater survival and smolt production in Pacific Northwest coho salmon (*Oncorhynchus kisutch*). *Canadian Journal of Fisheries and Aquatic Sciences* 61(3): 360-373

Mackun, P., S. Wilson, T. Fischetti, and J. Goworowska. 2011. Population distribution and change 2000 to 201: 2010 census briefs. U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau. March. 11 p.

Mantua, N., I. Tohver, and A. Hamlet. 2010. Climate change impacts on streamflow extremes and summertime stream temperature and their possible consequences for freshwater salmon habitat in Washington State. *Climatic Change* 102(1): 187-223.

Martins, J.M.F., N. Chevre, L. Spack, J. Tarradellas, and A. Mermoud. 2001. Degradation in Soil and Water and Ecotoxicity of Rimsulfuron and its Metabolites. Chemosphere 45:515-522.

McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NWFSC-42. 156 p.

McMahon, T.E., and G.F. Hartman. 1989. Influence of cover complexity and current velocity on winter habitat use by juvenile coho salmon (Oncorhynchus kisutch). Canadian Journal of Fisheries and Aquatic Sciences 46: 1551–1557.

Mote, P.W., J.T. Abatzglou, and K.E. Kunkel. 2013. Climate: Variability and Change in the Past and the Future. In Climate Change in the Northwest: Implications for Our Landscapes, Waters, and Communities, edited by M.M. Dalton, P.W. Mote, and A.K. Snover, 41-58. Island Press, Washington, DC.

Mote, P.W, A. K. Snover, S. Capalbo, S.D. Eigenbrode, P. Glick, J. Littell, R.R. Raymondi, and W.S. Reeder. 2014. Ch. 21: Northwest. In Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, T.C. Richmond, and G.W. Yohe, Eds., U.S. Global Change Research Program, 487-513.

Mote, P.W., D.E. Rupp, S. Li, D.J. Sharp, F. Otto, P.F. Uhe, M. Xiao, D.P. Lettenmaier, H. Cullen, and M. R. Allen. 2016. Perspectives on the cause of exceptionally low 2015 snowpack in the western United States, Geophysical Research Letters, 43, doi:10.1002/2016GLO69665

Meyer, J.L., M.J. Sale, P.J. Mulholland, and N.L. Poff. 1999. Impacts of climate change on aquatic ecosystem functioning and health. *JAWRA Journal of the American Water Resources Association* 35(6): 1373-1386.

NMFS. 2005. Assessment of NOAA Fisheries' critical habitat analytical review teams for 12 evolutionarily significant units of West Coast salmon and steelhead. NMFS, Protected Resources Division, Portland, Oregon.

NMFS. 2008. Endangered Species Act Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Willamette River Basin Flood Control Project. (July 11, 2008) Refer to NMFS No.: NWR-2000-2117).

NMFS. 2010. Endangered Species Act Programmatic Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Conservation Recommendations for Vegetation treatments Using Herbicides on Bureau of Land Management (BLM) Lands Across Nine BLM Districts in Oregon (September 1, 2010) (Refer to NMFS No: 2009/05539)

NMFS. 2011. Upper Willamette River conservation and recovery plan for Chinook salmon and steelhead. Oregon Department of Fish and Wildlife and National Marine Fisheries Service, Northwest Region.

NMFS. 2012. Endangered Species Act Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Invasive Plant Treatment Project on Deschutes National Forest, Ochoco National Forest and Crooked River National Grassland, Oregon. (February 2, 2012) (Refer to NMFS No: 2009/03048)

NMFS. 2013a. Reinitiation of the Endangered Species Act Section 7 Formal Programmatic Conference and Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Aquatic Restoration Activities in the States of Oregon and Washington (ARBO II). (April 25, 2013) (Refer to NMFS Nos.: NWP-2013-9664)

NMFS. 2013b. ESA Recovery Plan for Lower Columbia River Coho Salmon, Lower Columbia River Chinook Salmon, Columbia River Chum Salmon, and Lower Columbia River Steelhead. National Marine Fisheries Service, Northwest Region. June

NMFS. 2016a. Recovery plan for Oregon Coast coho salmon evolutionarily significant unit. West Coast Region, Portland, Oregon.

NMFS. 2016b. Initiation of the Endangered Species Act Section 7 Formal Programmatic Conference and Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Resource Management Plan for Western Oregon proposed by the Bureau of Land Management (BLM RMP). (July 15, 2016) (Refer to NMFS No.: WCR-2016-4089)

NMFS 2016c. Endangered Species Act Jeopardy and Adverse Modification of Critical Habitat Biological Opinion, “Not Likely to Adversely Affect” Determination, and Magnuson-Stevens Fishery Conservation and Management Act Fish Habitat Response for the Implementation of the National Flood Insurance Program in the State of Oregon. (April 14, 2016) (Refer to NMFS No: NWR-2011-3197)

Northwest Fisheries Science Center. 2015. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest.

ODFW and NMFS. 2011. Upper Willamette River conservation and recovery plan for Chinook salmon and steelhead. Oregon Department of Fish and Wildlife and National Marine Fisheries Service, Northwest Region.

PFMC. 2014. Appendix A to the Pacific Coast Salmon Fishery Management Plan, as modified by Amendment 18. Identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon.

PSU (Portland State University). 2012. 2011 Annual Population Report Tables. Population Research Center, Portland State University. March 28. www.pdx.edu/prc/annual-oregon-population-report. Accessed on April 3. 2012.

Rashin, E. B., C.J. Clishe, A.T. Loch, and J.M. Bell. 2006. Effectiveness of Timber Harvest Practices for Controlling Sediment. Journal of the American Water Resources Association 42:1307-1347.

Raymondi, R.R., J.E. Cuhaciyan, P. Glick, S.M. Capalbo, L.L. Houston, S.L. Shafer, and O. Grah. 2013. Water Resources: Implications of Changes in Temperature and Precipitation. *In* Climate Change in the Northwest: Implications for Our Landscapes, Waters, and Communities, edited by M.M. Dalton, P.W. Mote, and A.K. Snover, 41-58. Island Press, Washington, DC.

Reeder, W.S., P.R. Ruggiero, S.L. Shafer, A.K. Snover, L.L Houston, P. Glick, J.A. Newton, and S.M Capalbo. 2013. Coasts: Complex Changes Affecting the Northwest’s Diverse Shorelines. *In* Climate Change in the Northwest: Implications for Our Landscapes, Waters, and Communities, edited by M.M. Dalton, P.W. Mote, and A.K. Snover, 41-58. Island Press, Washington, DC

Reeves, G.H., D.H. Olson, S.M. Wondzell, S.A. Miller, J.W. Long, P.A. Bisson, and M.J. Furniss. Draft Synthesis of Science to Inform Land Management within the Northwest Forest Plan. Chapter 7: The Aquatic Conservation Strategy of the Northwest Forest Plan-A Review of the Relevant Science after 22 Years. USDA Forest Service, Pacific Norwest Research Station. Portland, OR. October 24, 2016.

Scheuerell, M.D., and J.G. Williams. 2005. Forecasting climate-induced changes in the survival of Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha*). Fisheries Oceanography 14:448-457.Shared Strategy for Puget Sound. 2007. Puget Sound salmon recovery plan. Volume 1, recovery plan. Shared Strategy for Puget Sound. Seattle.

SERA. 2014. Fluazifop-P-Butyl – Scoping/Screening Level Risk Assessment – Final Report. USDA, Forest Service, Forest Health Protection. SERA TR-056-07-02a, Morgantown, West Virginia

SERA. 2011a. Glyphosate – Human Health and Ecological Risk Assessment Final Report. SERA TR 052-22-03b. Prepared for the U.S. Department of Agriculture Forest Service, Atlanta, Georgia.

SERA. 2011b. Imazapyr– Human Health and Ecological Risk Assessment Final Report. SERA TR 052-29-03b. Prepared for the U.S. Department of Agriculture Forest Service, Atlanta, Georgia.

SERA. 2011c. Triclopyr BEE. Human Health and Ecological Risk Assessment Final Report. SERA TR 052-25-03b. Prepared for the U.S. Department of Agriculture Forest Service, Atlanta, Georgia.

SERA. 2009. Fluroxypyr - Human Health and Ecological Risk Assessment - Final Report. USDA, Forest Service, Forest Health Protection. SERA TR-052-13-03a. Atlanta, Georgia

SERA. 2008. Fluridone Human Health and Ecological Risk Assessment. Final Report. Prepared for USDA Forest Service and National Park Service. Syracuse, New York.

SERA. 2005. Hexazione – Human Health and Ecological Risk Assessment – Final Report. USDA, Forest Service, Forest Health Protection. SERA TR-05-43-20-03d, Arlington, Virginia

Stout, H.A., P.W. Lawson, D.L. Bottom, T.D. Cooney, M.J. Ford, C.E. Jordan, R.J. Kope, L.M. Kruzic, G.R. Pess, G.H. Reeves, M.D. Scheuerell, T.C. Wainwright, R.S. Waples, E. Ward, L.A. Weitkamp, J.G. Williams, and T.H. Williams. 2012. Scientific conclusions of the status review for Oregon Coast coho salmon (*Oncorhynchus kisutch*). U.S. Department of Commerce. NOAA Technical Memorandum NMFS-NWFSC-118. 242 p.

Sunda, W. G., and W. J. Cai. 2012. Eutrophication induced CO2-acidification of subsurface coastal waters: interactive effects of temperature, salinity, and atmospheric p CO2. *Environmental Science & Technology*, 46(19): 10651-10659

Tague, C. L., Choate, J. S., & Grant, G. 2013. Parameterizing sub-surface drainage with geology to improve modeling streamflow responses to climate in data limited environments. Hydrology and Earth System Sciences 17(1): 341-354

Tillmann, P., and D. Siemann. 2011. Climate Change Effects and Adaptation Approaches in Marine and Coastal Ecosystems of the North Pacific Landscape Conservation Cooperative Region. National Wildlife Federation.

Tejada AW; Bajet CM; Magbauna MG; Gambalan NG; Araez LC; Magallona ED. 1994. Toxicity of Pesticides to Target and Non-Target Fauna of the Lowland Rice Ecosystem. B. Widianarko, K.V ink, and N.M.Van Straalen (Eds.), Environmental Toxicology in South East Asia, VU Univ. Press, Amsterdam, Netherlands. pp. 89-103.

U.S. Department of Agriculture Forest Service and U.S. Department of the Interior Bureau of Land Management Aquatic and Riparian Monitoring Program (USDA FS and USDI BLM AREMP). 2015. Northwest Forest Plan 20-year Monitoring Report (1994-2014): Watershed Condition Status and Trends, BLM Western Oregon Resource Management Plan Area. Report on file with the AREMP, Corvallis, OR.

USDI BLM. 2014. Rimsulfuron Ecological Risk Assessment – Final. BLM Order No. L10PD04555, Washington, D.C.

USDI Bureau of Land Management. 1993. Sandy Wild and Scenic River and State Scenic Waterway Management Plan.

USDI Bureau of Land Management. 2008b. Westside Salem Integrated Non-Native Plant Management Plan Environmental Assessment.

USDI Bureau of Land Management. 2009. Cascades Resource Area Invasive Non-Native Plant Management EA.

USDI Bureau of Land Management. 2010a. Vegetation Treatments Using Herbicides on BLM Lands in Oregon Final Environmental Impact Statement. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=70730&dctmId=0b0003e880df5615

USDI Bureau of Land Management. 2010b. Vegetation Treatments Using Herbicides on BLM Lands in Oregon Record of Decision. https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=70730&dctmId=0b0003e880df5615

USDI BLM FEIS (Bureau of Land Management). 2016. Final Environmental Impact Statement (FEIS) for the Western Oregon Proposed Resource Management Plan. Prepared by USDI Bureau of Land Management Oregon / Washington State Office. Portland, Oregon. 745 p. http://www.blm.gov/or/plans/rmpswesternoregon/feis

U.S. EPA/OPP 1998 U.S. (U.S. Environmental Protection Agency/Office of Pesticide Programs). Review for Section 3 Registration of Fluroxypyr Acid (Chemical # 128959) and Fluroxypyr MHE (Chemical # 128968-5). Report dated June 8, 1998. Copy courtesy of Dow AgroSciences.

Wainwright, T. C., and L. A. Weitkamp. 2013. Effects of climate change on Oregon Coast coho salmon: habitat and life-cycle interactions. *Northwest Science* 87(3): 219-242.

Winder, M. and D. E. Schindler. 2004. Climate change uncouples trophic interactions in an aquatic ecosystem. Ecology 85: 2100–2106

Zabel, R.W., M.D. Scheuerell, M.M. McClure, and J.G. Williams. 2006. The interplay between climate variability and density dependence in the population viability of Chinook salmon. Conservation Biology 20(1):190-200